UC Riverside - IR-4 Program

Department of Agricultural Operations, University of California, Riverside, CA

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SOP numbering Format: [Facility ID] - [sop category] - [sop number] . [version number]

*All SOPs have been reviewed prior to signing

Field Research Director*: Nathan Leach — Nathan Leach — 12-5-22 — Date

SOPs approved by*: Mika L. Tolson — Mika Tolson, Assistant Regional Field Coordinator — 12/12/2022 — Approval Date

SOP Number: UCR-10-1.2

Title: IR-4 Program Management

PURPOSE: To define the responsibilities of the University of California, Riverside (UCR) IR-4 Program management.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURES:

1.0 Field Research Director Responsibilities

1.1 Assure each study is conducted according to an approved protocol and Standard Operating Procedures (SOPs), and that appropriate documentation is provided. Maintain good communication with the Study Director and the Regional Field Coordinator (RFC).

1.2 Assure that personnel, resources, facilities, equipment, materials and methods are available as scheduled and are adequate for the completion of the project.

1.3 Assure that all personnel involved in study conduct are adequately trained to perform their assigned tasks. Training will include Good Laboratory Practices and Standard Operating Procedures that apply to those tasks.

1.4 Report all deviations from the protocol, GLPs, or SOPs to the Study Director and the RFC and initiate remedial action when required. Respond in writing to all QAU findings**.**

1.5 Maintain a study list of all IR-4 field research projects. Maintain an IR-4 project organizational chart.

1.6 Maintain on file a current summary of training, education and experience; and a job description for all personnel engaged in the conduct of a study.

1.7 Assure that all required records are maintained and archived when appropriate.

SOP Number: UCR-10-2.4

Title: Standard Operating Procedures

PURPOSE: To provide guidelines for creating, revising, maintaining and archiving Standard Operating Procedures (SOPs).

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURES:

1.0 All SOPs will be uniquely identified by number. Each number will begin with the prefix 'UCR' to identify the research facility (UC, Riverside), followed by SOP category, sequential SOP number and version number.

SOP Categories:		
	10	Administration
	20	Data
	30	Test System
	40	Test Substance
	50	Test System Samples
	60	Equipment

Format: (Facility ID)-(sop category)-(sop number).(version number)
Example: (UCR)-(10)-(1).(1).

2.0 All current, active SOPs will be listed in a Table of Contents. The SOP Table of Contents listing all SOPs will be signed and dated by the author (submitting scientist), and by the Regional Field Coordinator (RFC) or Assistant Regional Field Coordinator (ARFC), signifying approval. SOPs are effective as of the date approved by the RFC/ARFC.

3.0 Each SOP will define its scope and purpose, describe procedures routinely implemented, and the records that may be required by these procedures. Each page will be numbered.

4.0 Original signed SOP shall be stored in the UCR Retention File and copy(s) kept in areas accessible to all study personnel.

5.0 Each SOP should be reviewed a minimum of every 2 years, and revised to reflect current procedures, if necessary. A record of the dates of review or revision will be maintained. A "revision" provides a substantive change in the meaning of the SOP. Correcting spelling and formatting errors along with making minor changes that clarify the intended meaning of the SOP do not constitute a revision.

6.0 Outdated SOPs will be permanently archived at the IR-4 Headquarters archive and all copies will be destroyed, with the exception of one, to be stored in the UCR Retention File. Retired SOPs will be listed in the index as such for at least 1 year following retirement, and can be removed from the index in subsequent years.

7.0 Each study protocol shall serve as the standard operating procedure for that study and shall supersede UCR SOPs in the event of a conflict with them.

SOP Number: UCR-10-2.4

Title: Standard Operating Procedures

8.0 Common abbreviations used in UCR SOPs and raw data generated during the conduct of IR-4 Program research trials may include the following:

Abbreviation	Definition
ac	Acre
AgOp	UCR Agricultural Operations Department
ARFC	Assistant Regional Field Coordinator
C	Celsius
CAS	Chemical Abstract Number
CV	Curriculum Vita
CVARS	Coachella Valley Agricultural Research Station
EPA	(United States) Environmental Protection Agency
F	Fahrenheit
FDB	Field Data Book
FID #	Field Identification Number
FRD	Field Research Director
g	Gram
GLP	(EPA) Good Laboratory Practices
gpa	Gallons Per Acre
h	Hour(s)
IR-4	Inter-Regional Research Project #4
l	Liter
MSDS	Material Safety Data Sheet
NIST	National Institute of Standards Technology
QAU	Quality Assurance Unit
rep	Replicate (n.)
RFC	Regional Field Coordinator
RH	Relative Humidity
SCREC	South Coast Research & Extension Center
SD	Study Director
SOP	Standard Operating Procedure
SRA	Staff Research Associate
trt	Treated
TS	Test Substance
UCR	University of California, Riverside
utc	Untreated (control)

SOP Number: UCR-10-3.5

Title: Personnel

PURPOSE: To define requirements for all trial personnel and related records.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURES:

1.0 A professional resume or curriculum vitae (CV), a job description, and training records for each person engaged in the conduct of a trial will be maintained and, as raw data, will be archived at IR-4 Headquarters.

2.0 All personnel will be adequately trained for their assigned tasks. As appropriate, training curriculum will include SOPs, GLPs, UC policies, and technical training relevant to the IR-4 studies.

3.0 Personnel records will be reviewed approximately every two years and revised or updated as needed.

4.0 A Personnel Short Form or a CV for any temporary or seasonal field personnel will be retained on file. Personnel documents for former employees will also be retained. CVs or Personnel Short Forms will not be completed or retained for temporary work crews or other UCR personnel that may occasionally be utilized for non-GLP plot maintenance tasks. The aforementioned personnel will be directly supervised by GLP trained staff.

SOP Number: UCR-10-4.4

Title: Quality Assurance

PURPOSE: To define Quality Assurance procedures used to ensure that facilities, equipment, personnel, methods, practices, records and controls utilized in GLP studies meet regulatory requirements.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 All QAU (Quality Assurance Unit) procedures/activities will be conducted according to and in compliance with the IR-4 QAU SOPs.

SOP Number: UCR-10-5.3

Title: EPA Inspections

PURPOSE: To provide guidance for facilitating audits by the Environmental Protection Agency, Office of Compliance Monitoring.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Prior to Inspection

1.1 When received, the Notice of Inspection will be reviewed to determine the specific intent of the inspection. The Study Director(s), Quality Assurance Unit, and other interested parties will be notified of the pending audit or review as soon as possible.

1.2 Personnel who may be associated with the trial(s) or facilities audit should be briefed and scheduled to be available for the audit.

1.3 Documents that may be required during the inspection may include, but not necessarily be limited to:

1.3.1 UCR Master Schedule
1.3.2 SOPs
1.3.3 Facility- and study-related raw data
1.3.4 Personnel Records (training, CVs, job descriptions)

1.4 Information not subject to EPA inspection includes, but may not necessarily be limited to:

1.4.1 QA Inspection Findings
1.4.2 Financial data
1.4.3 Confidential personnel data
1.4.4 Non-GLP research data

1.5 Organizational charts, facility maps, and any information specific to the facility or area should also be made available to assist inspectors during the audit.

2.0 During Inspection

2.1 The inspection team will be received at UCR following standard facility policy. Name tags will be provided to each inspector and the inspection team will be escorted to a conference or meeting room.

2.2 Each inspector will be asked to provide credentials, and the name and badge number of each inspector will be recorded. The inspection team will be asked to provide the proposed inspection agenda and expected duration.

SOP Number: UCR-10-5.3

Title: EPA Inspections

2.3 Personnel shall provide only what is specifically requested by inspectors. Personnel shall not provide extraneous information in order to avoid disrupting the inspection schedule. If personnel are unable to provide requested information, they will refer the inspector to the appropriate personnel and will not speculate what the answer may be.

2.4 Comments, observations and discussions associated with the inspection will be documented.

2.5 In the event that a non-compliance issue is raised during the inspection, every attempt shall be made to correct the deficiency and provide confirmation of that correction to the inspection team.

3.0 Post Inspection

3.1 All personnel involved in the inspection should attend the exit interview. Issues, comments, concerns and suggestions discussed during the exit interview will be documented.

3.2 Any discrepancies or deficiencies shall be discussed and clarified if necessary. It will be verified that any problems that may have been discovered and mitigated during the inspection have been duly noted in the inspection record.

3.3 A complete set of all copies of all documents provided to the inspection team will also be retained along with inspection notes.

3.4 After the inspection, all appropriate parties will be informed of inspection activities and findings. Remedial action for problems that may have been detected during the inspection will be discussed and a plan of action initiated.

3.5 If required, inspection findings will be responded to in a timely manner.

SOP Number: UCR-20-1.6

Title: Raw Data (Recording) and Rounding

PURPOSE: To define methods used to ensure that raw data supporting a study conducted in compliance with GLP guidelines are collected and recorded accurately and promptly.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 All raw data will be recorded in permanent blue or black ink and will be initialed and dated by the person recording the data, on the day of entry. Any correction or changes made to raw data shall not obscure the original entry, and reasons for the change, date, and initial, will be recorded.

2.0 All information transcribed from original raw data such as recorder charts or logbooks will be identified as such, and the location of the original data noted.

3.0 Whenever a raw data document is copied, it will be clearly identified as a true copy and initialed and dated by the person verifying its authenticity.

4.0 Study Specific Data

4.1 All study-specific data should be clearly marked with the name of the project, Field I.D. Number, and other information that may be needed to understand the data and its source.

4.2 The study protocol will be carefully referenced to ensure that all data required are collected and recorded promptly. It is the responsibility of the Field Research Director to ensure that all raw data, summaries, and other items connected with the study that need to be retained are stored in the study file.

4.3 All study-specific raw data will be recorded on the IR-4 Field Data Reporting Form or on an appropriately labeled data sheet. Each portion of the form should be filled in as completely and accurately as possible as it pertains to the study after the information is available.

4.4 Unused FDB pages will be lined out and initialed and/or signed, and dated or removed from the FDB if page is optional. Unused spaces or lines on a page may also be lined out and initialed and/or signed and dated. Entries made to line out unused portions of a page will be made in a manner that clearly distinguishes them from entries that may have been made to indicate repetitive information (i.e. - a distinct arrow, ditto marks, etc.)

4.5 Extra pages may be photocopied when needed. No pages will be permanently removed from the book unless designated as optional pages.

SOP Number: UCR-20-1.6

Title: Raw Data (Recording) and Rounding

4.6 The narrative portion of the FDB forms should be used to summarize the findings or provide clarification, if necessary.

4.7 At a minimum, information to be retained in the FDB should include (when applicable):

4.7.1 Copies of applicable facility records and supporting data (temperature, weather, personnel and equipment records; custody logs; correspondence, etc.)
4.7.2 All data required by the protocol

5.0 Procedure for rounding numerical data entries and calculations

5.1 For measurements, record to the degree of accuracy of the device used for the measurement. (E.g. if reading from a balance that records to 0.1 g., record 12.3 g., not 12.30 g.)

5.2 Where applicable, round decimal numbers to the nearest hundredth (second number to the right of the decimal).

5.3 An exception is that temperature data may be rounded to the nearest whole degree.

5.4 Do not round any numbers within a calculation, round only the final result. Look at the digit following the digit that is to be last.

If less than 5, drop this digit and all digits to the right (1.2345 = 1.23)
If equal to or greater than 5, increase the rounded digit by 1 (12.345 = 12.35)

5.5 Significant figures of measurements used in the calculation can be used for guidance on where to round the final result.

5.6 Conversion factors and other constants (e.g., sq. ft./acre, lbs a.i./gal) are not measurements and do not need to be rounded.

SOP Number: UCR-20-2.4

Title: Disposition of Field Data Books

PURPOSE: To provide guidelines for handling study specific raw data at study completion.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Upon completion of the study, the Field Research Director (FRD) shall make an exact copy or electronically scan the original raw data including completed FDB and all supporting data (e.g. correspondence, protocol deviation forms, facility logs and records, etc.) The FRD will retain the copy or scanned file and send the original FDB via trackable courier to the Regional Field Coordinator:

Western Region IR-4 Program
450 Bioletti Way
4218 Meyer Hall
University of California
Davis, CA 95616

2.0 Electronically scanned FDBs and supporting information will be stored on a hard drive and backed up to a secondary drive for as long as they need to be retained.

3.0 The Regional Field Coordinator (RFC) will review the FDB for completeness and accuracy, and follow up with the FRD if necessary to obtain additional information or clarification.

4.0 Changed pages from the Quality Control review will be kept with the copy of the FDB until the final notebook is available on the Western Region website. The website version of the notebook will be used when responding to Quality Assurance audits.

5.0 After review, the RFC will transfer the FDB to the Quality Assurance Unit for audit. After Quality Assurance review, the FDB will be sent to the Study Director.

6.0 Copies of older FDBs may be discarded if no longer needed (i.e. they are available to download from the Western Region website or as indicated by project status listed in the Test Substance Container Disposal Approval database on the IR-4 headquarters website).

SOP Number: UCR-20-3.7

Title: Archiving Raw Data

PURPOSE: To define procedures for maintaining, transferring and archiving original facility raw data.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 The official IR-4 Archive for all original raw data is located at IR-4 Headquarters.. No original raw data will be permanently archived at UCR.

2.0 Prior to archiving, raw data documents will be stored in the UCR Field Retention File. The Retention File is stored in a file cabinet located in the office of the Field Research Director that remains locked when unattended.

3.0 The IR-4 Field Research Director serves as administrator of the Retention File. The Retention File may only be accessed by the FRD, the UCR IR-4 Program Director (Peggy Mauk), or someone under their supervision.

4.0 The Retention File will contain, at a minimum:

4.1 True copies of historical: SOPs (outdated); facility records (e.g. temperature, equipment, inventory, etc.).

4.2 Current originals: SOPs, facility records (e.g. temperature, equipment, inventory, etc.).

4.3 Copies of: completed FDBs less than 1 year old (copies of older FDBs may be held in general storage); QA inspection reports.

4.4 Originals of all historical and current personnel records (e.g. CVs, job descriptions, training), organization charts, maps, climatic data.

5.0 Original documents to be permanently archived will be transferred to IR-4 Headquarters on an approximate annual schedule. The archiving schedule will be determined by the FRD. Copies of the archived material should be made before shipment.

6.0 Transfer to IR-4 can be by hand or by a courier service. If a courier service is used, then a Chain of Custody Form consistent with IR-4 Advisory #2006-1 should include identity of the service and a tracking number that can be used to trace the shipment. Included with the shipment should be an inventory of the transferred documents. A copy of the Chain of Custody Form and inventory will be sent to the Regional Field Coordinator.

SOP Number: UCR-30-1.2

Title: Commodity Establishment and Maintenance

PURPOSE: To provide guidelines that ensure commodities are grown under good agricultural practices and provide a uniform crop for study.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Site selection will be made in accordance with the accepted horticultural practices for the commodity. Whenever possible, test sites will be located at UCR. When necessary, test sites will be located at CVARS, SCREC, or in a commercial production field or grove at the discretion of the FRD.

2.0 When field trials are conducted in commercial production fields, accepted grower practices will be considered as standard procedure unless it conflicts with the protocol. Crop establishment and maintenance will usually be the responsibility of the grower.

3.0 In conducting studies off-site with a grower, the FRD or IR-4 personnel under FRD's supervision will communicate frequently with the grower about agronomic activities in and around the test site. The grower should be kept fully informed of the study requirements for the plots and be able to provide a record of agronomic activities for the site.

4.0 When trials are conducted at UCR, CVARS, or SCREC agronomic practices shall be performed to bring the production practices within the requirements of the commodity.

5.0 For questions concerning crop production, current published literature may be used for reference, or an extension/horticulture specialist or a commercial grower familiar with the subject production practices may be consulted.

6.0 The protocol will define the crop species. If the variety is not defined, one that is commonly grown in the area by commercial producers should be used. If a commercial producer is providing transplants, those most uniform will be selected.

SOP Number: UCR-30-2.6

Title: Test Site (Selection, Design, Maintenance, Destruction)

PURPOSE: To provide guidelines for test site selection and management.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program

PROCEDURES:

1.0 The test site should be located so there is sufficient isolation to preclude contamination by substances from external sources such as commercial operations or other research studies.

2.0 Treated and untreated control plots will be adequately separated to prevent cross-contamination during test substance application. Factors such as the type of application equipment, the type and size of the test system, slope, and likely wind direction and intensity should be considered when determining buffer distances and directions.

3.0 Experimental design of the plot will be driven by the protocol. If not defined by the study protocol, a commonly accepted experimental design (e.g. randomized complete block, replicated strip) will be used, when applicable.

4.0 The test site will be large enough: a) to accommodate the required number of replicates, buffer zones and treatments in accordance with an approved protocol, and b) for the commodity to be grown under commercial conditions yielding samples of sufficient size for analysis where required.

5.0 Each plot will be established using a suitable measuring device. End boundaries will be clearly defined with visible markers such as stakes or flags. Each test plot will be marked clearly according to the protocol. At a minimum, the sign should include the Field I.D. Number and treatment name or number.

6.0 The test plot boundaries and their locations relative to each other, to established landmarks, and to the North azimuth shall be recorded on a plot map. The closest distance between treated and control plots and the distance to at least one permanent landmark shall also be recorded. When applicable, sub-plots and/or replicate plots will be documented.

7.0 Whenever possible, maintenance pesticides should be approved by the Study Director prior to use. No pesticide should be applied to the test system that may interfere with the objectives of the study. When necessary, the analytical laboratory will be contacted for additional information that may be required to determine suitability of a maintenance pesticide.

8.0 After test substance application, plot maintenance activities will proceed from the untreated control plot first before moving into the treated plot(s).

9.0 When required, at the conclusion of the field study crops treated with the test substance will be destroyed in accordance with regulatory requirements. In most cases, row crops will be disked under, and commodities from permanent crops will be dropped to the

ground and removed from the test site or destroyed in a manner that will render it unusable.

10.0 When it is necessary to sample and analyze soil in order to describe the parameters required in Protocols and FDBs, the FRD will collect samples that are representative of the designated area(s), handle them in a manner that does not compromise their integrity, and expedite their delivery to an analytical laboratory.

SOP Number: UCR-30-3.4

Title: Performance Evaluation

PURPOSE: To define procedures for collecting performance field data.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURES:

1.0 Phytotoxicity Data

1.1 Consult the protocol to determine the necessity for, timing of and method of collection of phytotoxicity data. If data are to be collected but no method is cited, then proceed as follows:

1.2 Where possible, take phytotoxicity data within 3 days before the initial pesticide treatment and within two to four weeks after the treatment. If symptoms occur during or after this period that warrant an additional reading, then phytotoxicity data should be taken as necessary.

1.3 Impartially select plants in the middle rows of each plot and record a phytotoxicity rating of 0 to 10. 0= no injury, 10 = death of plants.

1.4 Other suitable methodologies may be employed at the discretion of the FRD and will be appropriately described and referenced in the FDB.

2.0 Efficacy/Pest Control Data

2.1 Consult the protocol to determine the necessity for and method of collection of efficacy data. If the data are required but no method is cited, then methodologies other than those described herein will be documented in the FDB. Where possible, take pest data within two days before the initial pesticide treatment, within one week after the treatment, and at intervals thereafter which are appropriate for the pest.

2.1.1 Disease data: record the name of the disease(s) being observed. Describe the symptom(s) for each disease. Impartially select plants in the middle rows of each plot, and record the severity of each disease in a rating system of 0 to 10 for each plant. 0 = plant healthy, 5 = plant showing moderate symptoms of disease, and 10 = plant dead.

2.1.2 Insect/mite data: record the name of the pest(s) being observed. Record the damage symptom(s) for each insect. For damage symptoms, impartially select plants in the middle rows of each plot and record the severity of damage for each pest in a rating system of 0 to 10 for each plant. 0 = plant healthy, 5 = plant showing moderate damage, and 10 = plant dead. For pest population counts, take a representative sample of the pest population (e.g. five leaves/plant of five plants/plot, four 3-inch diameter soil cores/plot, 100 apples/tree, etc.) to ensure an accurate

reflection of the pest density per plant or unit area.

2.1.3 Weed data: observe each plot and record the names of the most prominent weed species. Data can consist of estimates either of species' percentage of the plot canopy or else numbers of weeds within a measured area.

2.1.4 Nematode data: contact the Study Director to ascertain expectations and procedures.

3.0. Yield Data

3.1 Where possible, obtain a reasonably up-to-date copy of the United States standards for grades of the commodity under study from the Agricultural Marketing Service or other sources. If U.S. grade standards do not exist, then consult other sources and document the plant stage, fruit ripeness, or other characteristics needed to determine quality.

3.2 Check the protocol for information on time of harvest. If none, then follow commercial practices in the area for the time of harvest of the commodity. These practices should be documented.

3.3 Where grading standards are known, the commodity should be graded accordingly at harvest.

3.4 Harvesting from the borders of the plots should be avoided, and the amount of harvested area should be recorded (e.g. 50 row feet, two trees). Each portion of the commodity, divided as to its quality standard, should be weighed and/or measured to determine yield. Use a certified scale to record weights. Calibrate scale prior to use to ensure accuracy. Written records should be kept of each measurement for each plot.

3.5 The method used to harvest the commodity should be referenced.

SOP Number: UCR-40-1.11

Title: Test Substance and Adjuvant Receipt, Storage and Disposal

PURPOSE: To provide guidelines for managing test substances and adjuvants in a manner consistent with GLP requirements.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Test Substance Receipt

1.1 Test substances will be received at the UCR, Agricultural Operations office. The FRD or a qualified designee will transfer the test substance to the IR-4 Program test substance storage area within two days.

1.2 Upon receipt, the test substance will be logged into the appropriate FDB and the UCR IR-4 Test Substance Receipt and Distribution Log which is stored with the test substances

2.0 Test Substance and Adjuvant Storage

2.1 Test substances and adjuvants will be stored in accordance with label instructions and current policies and guidelines of UCR.

2.2 At a minimum, all test substance containers, including 2^0 or service containers, must be labeled with:

2.2.1 Name, CAS or code number
2.2.2 Batch/lot number
2.2.3 Expiration date
2.2.4 Storage conditions

In the event that any of this information has not been provided, secure that information from the COA, MSDS, or Study Director and add the information to the test substance container label.

2.3 Document the following information for adjuvants:
- Date received at the field facility (usually the purchase date)
- Date placed in storage
- Identity and concentration of the adjuvant
- Recommended storage conditions
- Expiration date
  - If no expiration date is supplied by the manufacturer or can be obtained by contacting the manufacturer, assign an expiration date up to 2 years from the date of purchase (unless other information supporting a different expiration date is available).

Document that the adjuvant is maintained according to the recommended storage conditions

SOP Number: UCR-40-1.11

Title: Test Substance and Adjuvant Receipt, Storage and Disposal

The original container and secondary containers used to store an adjuvant must be labeled with name, concentration, storage conditions and expiration date. These requirements do not apply to temporary containers used for measuring, but they should be adequately labeled to uniquely identify the product.

2.4 Test substances and adjuvants will be stored in a dry, well ventilated location that is separate from offices, laboratories, test substance mixing areas, or sample storage areas. Test substances will not be stored next to food, feed, seed (other than treated seed used in an IR-4 trial), fertilizer (other than additives used for IR-4 trials), or other articles intended for consumption or use by humans or animals; or near food, beverages, tobacco, clothing and eating utensils.

2.5 While the test substance storage area may not be climatically controlled, storage temperatures rarely exceed a range of 32 - 100 degrees Fahrenheit.

2.6 The storage temperature will be monitored with a continuous temperature recording device and a minimum/maximum thermometer as a backup. The min/max reading will be recorded in a log at regular intervals, weekly if possible and reset at each recording.

2.6 The test substance storage facility shall be locked when unattended and accessed only by authorized persons.

2.7 Highly visible, waterproof identification signs shall be posted on doors, gates, buildings, or fences to advise of the hazardous nature of the storage facility's contents.

2.8 Telephone numbers and names of personnel responsible for and knowledgeable of the contents of the storage facility shall be prominently posted.

2.9 Materials such as absorptive clay, granulated activated charcoal, hydrated lime, or sodium hypochlorite shall be readily available for emergency treatment or detoxification of spills or leaks.

2.10 Test substances that could be damaged by moisture or water will be stored in a manner that will not compromise their integrity.

2.11 A current inventory of all test substances in the storage unit shall be kept in a location accessible to study personnel.

2.12 All pesticides (i.e. test substances and any maintenance chemicals) will be stored and handled in such a manner that prevents contamination of the storage area and equipment therein. Containers are not to be opened in the storage area, and shelves are to be secured against upset due to earthquakes.

SOP Number: UCR-40-1.11

Title: Test Substance and Adjuvant Receipt, Storage and Disposal

3.0 Adjuvant Use and Handling

1. Adjuvants must be handled in a manner to prevent contamination with test substances and other spray additives, e.g. dispense into a temporary container for measuring (and discard any remaining adjuvant in the temporary container), use a new disposable measuring device to measure adjuvant directly from the original container (and discard after single use), etc.

2. If there are any questions or concerns about the integrity or condition of the spray additive (e.g. contamination, color change, consistency, odor) it should be removed from use for GLP residue trials.

4.0 Test Substance Disposal

4.1 The original containers for all GLP test substances must be retained until completion of the study and the Study Director has approved disposal of the containers.

Test substance container disposal can be confirmed on the IR-4 website at: https://ir4app.cals.ncsu.edu/Ir4FoodPub/SubstanceDispoSch

4.2 Upon approval by the Study Director, the test substance and containers may be returned to the manufacturer or registrant. Transportation must be according to all Federal, State, and local laws and regulations.

4.3 After completion of the field trial, remaining test substance may be transferred to the UCR chemical warehouse or to the UCR Department of Environmental Health & Safety, but containers must be retained until completion of the entire study (as referenced in 4.1 above).

SOP Number: UCR-40-2.8

Title: Test Substance Application

PURPOSE: To provide guidelines for test substance application methods that ensures study integrity and compliance with regulatory requirements.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program

PROCEDURE:

1.0 Safety

1.1 UCR pesticide safety policies will be followed by all personnel involved in handling pesticides.

1.2 All personal protective equipment and clothing as required by the label or study protocol shall be worn in the handling of pesticides for storage, mixing, and application. Emergency personal protective equipment (e.g. coveralls, self-contained breathing apparatus) must be available when handling hazardous pesticides such as restricted use pesticides.

1.3 A supply of soap/detergent and water should be readily accessible for cleanup in the case of an emergency.

1.4 When applicable, re-entry restrictions will be observed following pesticide applications. For persons who regularly handle organophosphates and/or large quantities of carbamates, a cholinesterase level should be established, and monitored on at least an approximate annual basis.

2.0 Measuring

2.1 Liquid

2.1.1 Graduated Measurement Devices

2.1.1.1 When measuring with a device marked in graduated increments, volume should not be estimated. The increment nearest the actual volume level should be the reported volume so that a greater degree of accuracy is not implied.

2.1.1.2 Exact measurements should be made by measuring to an exact increment, and cylinders or pipettes with greater accuracy should be used when necessary.

2.1.2 When measuring chemicals, tank mix additives, or tank mix carrier, all measurements must be the volume as recorded in the data.

2.1.3 When measuring spray system discharge volume during calibration, measurements from each nozzle must be made with the same cylinder to eliminate any variance in the accuracy between cylinders used.

2.2 Dry

2.2.1 Verification of the weighing instrument should be done prior to weighing the quantity for use in the study using weights that bracket the target weight of test substance.

2.2.2 Weighing instruments used for weighing test substance shall have a readability to at least 0.1 gram.

3.0 Mixing

3.1 The pH, as measured with pH indicator strips, and the temperature of water used as the carrier will be measured and recorded as close as practicable to the time of mixing.

3.2 The method of mathematical calculations used to determine test substance usage will be the choice of the FRD. Tank mixes will be prepared in a volume appropriate for optimal spray system operation and plot coverage, minimizing leftover tank mix after the application.

3.3 When preparing a tank mix using a liquid test substance formulation or other liquid additive, the total tank mix volume must be adjusted by the volume of that liquid. This adjustment can be accounted for within the calculations or by actual removal of water from the mix.

3.4 Part or all of the carrier will be added to the spray tank before the test substance is added. When possible, part of the pre-measured carrier will be used to thoroughly rinse chemical containers and/or measuring utensils into the spray tank.

3.4.1 If using an adjuvant, follow the mixing instructions (if any) on the adjuvant label.

3.5 If deemed necessary, a homogeneous slurry will first be prepared by blending the pre-measured test substance with a small amount of the pre-measured carrier, then added to the spray tank. Triple rinse the slurry container into the spray tank.

3.6 Spray mixtures will be sufficiently agitated prior to use, and will be applied to the test plot no more than two hours after preparation (or according to the protocol timing), and generally within 5 to 10 minutes.

3.7 It is acceptable to pre-measure the required amount of test substance needed for an application, rather than transporting the entire original container of test substance to the test site. The amount needed can be pre-measured (following procedures outlined in 2.0 above) into a clean glass or Nalgene jar with a tight-fitting lid and labeled in accordance with GLP and UCR IR-4 SOPs. In addition, the label should include the weight or volume of test substance within the

container.

3.8 Test substance should be transported in a clean, stable container (preferably a cooler) separate from the application equipment. During transport, the integrity of the test substance may be ensured by including blue ice in the transport container. Document the conditions within the container via a Max/Min thermometer, Hobo-Temp. recorder, or some other suitable device.

3.9 If the test substance is mixed in a tank and transported in a vehicle, the tank mixture must be labeled with the name of the pesticide (trade name and active ingredient), signal word (caution, warning, danger), and the name and address of the person responsible for the container and the pesticide.

4.0 Application

4.1 Application will be made when environmental conditions such as wind or rain will not interfere with uniformity of the application. If adverse conditions prevail, and a critical timing is affected, the Study Director should be contacted for guidance. The RFC and/or ARFC should also be notified.

4.2 All precautions should be taken to avoid applying pesticides to or near sensitive areas or where drift to these areas may occur.

4.3 When making applications at different treatment rates with the same test substance, applications should be made in order from the lowest to highest treatment rate. When making applications at the same treatment rates but different application volumes per acre (GPA), applications should be made in order from the highest (dilute) to the lowest (concentrate) GPA.

4.4 Where the application of restricted use pesticides is required in a study, the applicator must be certified or under the direct supervision of a certified applicator.

4.5 After application, leftover tank mix will be safely discarded by one of the following methods:

4.5.1 Spraying over a non-crop area at the field site in such a way as to ensure that contamination of the plot is prevented.

4.5.2 Spraying on a crop with a registered use

4.5.3 Spraying an area of the same crop which will not be used in the study.

4.6 The actual application rate shall be considered acceptable if it is within the range of -5% to +10% of protocol specified application rate. If the application did not meet this range, the Study Director, RFC and/or ARFC must be notified of this deviation before proceeding with the trial.

SOP Number: UCR-50-1.9

Title: Residue Sample Collection

PURPOSE: To provide guidelines for collection of residue samples that ensures compliance with regulatory requirements.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 The study protocol will establish specific dates for the collection of samples. If these dates are based on uncontrolled events (plant size, fruit maturity, etc.) then tentative dates should be established and refined as necessary. If requested, the Quality Assurance Unit will be kept informed of these dates.

2.0 Residue sampling supplies should not be stored with or near pesticides or application equipment. Whenever possible, plastic laminated cloth bags will be used for residue samples.

3.0 Prior to sampling, the exterior of each sample bag will be labeled in waterproof ink with information specified in the protocol. If none is specified, then include at least the following information:

3.1 Field ID Number
3.2 Crop fraction
3.3 Test Substance
3.4 Sample ID and Treatment Number
3.5 Harvest and Sample Dates
3.2 Field Research Director and telephone number

4.0 Additional sample identification of the Field ID, treatment number, and sample ID will be written on the outside of the sampling bag with a permanent marker.

5.0 The study protocol should establish sample quantity. In the event that it does not, samples will be collected that shall be adequate to fulfill the analytical requirements in order to support the objectives of the study. Non-GLP maintained scales/balances may be used to establish estimated residue sample weights in IR-4 GLP studies.

6.0 Samples will be collected in an impartial manner that is representative of the entire plot, unless a unique sampling scheme is required by the protocol. Plot edges and ends will be avoided during sampling, unless those areas are an integral part of the sampling scheme.

7.0 Samples will first be collected from the untreated control plot(s), progressing in order from the lowest to the highest treatment rate. Plots may be sampled simultaneously by separate personnel.

SOP Number: UCR-50-1.9

Title: Residue Sample Collection

8.0 Contamination of the sample in any way shall be avoided during the sampling, processing, labeling, storage, and shipping processes. Special care taken during sample collection and handling will include:

8.1 Diseased or undersized crop parts will be avoided
8.2 Care will be taken to avoid removal of surface residues
8.3 Disposable gloves will be worn and changed between samples
8.4 A separate set of hand tools will be used for the untreated and the treated samples, if available. Tools will be cleaned with soapy water and rinsed with clean water, then wiped dry with alcohol and a clean absorbent material prior to use and between treatments. Tools will be rinsed with water and wiped clean between samples.
8.5 If crop requires modification before placing in sample bag, the crop will be cut or otherwise modified in a safe manner with proper tools (e.g. using knives and cutting board on the tailgate of the truck).
8.6 Soil or plant parts will not be removed from the raw agricultural commodity, or the commodity trimmed, unless allowed by the protocol.

9.0 Residue samples should be removed from heat and direct sunlight as soon as possible to minimize degradation of the test substance. In the event that the time from collection to frozen storage is expected to exceed one (1) hour, treated and control samples should be placed in separate containers with ice or an ice substitute (e.g. "blue ice") to preserve the samples prior to frozen storage, and temperatures should be monitored and recorded. Different containers or other method of separation such as double bagging should be used for each treatment dosage. Exceptions might include crop samples that must be dried or processed such as grains, beans, nuts and cotton.

SOP Number: UCR-50-2.8

Title: Residue Sample Storage and Shipment

PURPOSE: To provide guidelines for the proper storage and shipment of residue samples that ensure sample integrity and regulatory compliance.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program

PROCEDURE:

1.0 Storage

1.0 All samples will be frozen as soon as possible following their collection, or as soon as any processing requirements have been met, unless other storage requirements are specified by the study protocol. Samples of different treatment doses will be stored in a manner that will avoid the potential of cross contamination of samples.

1.2 Samples identified for post-harvest processing should be processed or shipped to the processor as soon after collection as possible.

1.3 The freezers which contain samples shall be locked when unattended.

1.4 Frozen samples will be stored generally below 0 degrees Fahrenheit (-18 degrees Celsius) and temperatures will be monitored with a verified device. Temperature spikes which occur during defrost cycles and freezer loading or unloading do not affect sample integrity.

1.5 An inventory log will be maintained of samples stored in the freezer. This log shall contain a description of the sample (sample type), FID#, the protocol-specified Sample ID, dates/times of freezer entry or removal and the initials of the person storing or removing samples.

2.0 Shipping

2.1 Prior to shipping, the Residue Sample Shipping and Identification Form should be completed, signed, and dated by the FRD. A copy of the form must be placed in a waterproof container and packed in each sample box. The original Residue Sample Shipping Form shall be kept in the FDB.

2.2 When possible, all samples should be placed in the same shipping box if their total weight is less than 75 pounds. Each treatment should be separated by double bagging samples in large plastic bags, or ~~and~~ using cardboard and/or newspaper layers between different treatments

2.3 As soon as practicable after shipment, the residue laboratory and RFC will be contacted by phone, fax, or e-mail and notified of shipment dates and methods. Nearby laboratories should be notified before shipment if possible.

SOP Number: UCR-50-2.8

Title: Residue Sample Storage and Shipment

2.4 All residue samples will be shipped in suitable containers of sufficient size and strength to hold the residue samples.

2.5 For all shipping containers:

2.5.1 Address labels (sender and recipient) must be affixed to the exterior
2.5.2 Must be numbered in a way that indicates the total number of containers being shipped for a given study. (e.g. 'Box 1 of 1', 'Box 1 of 6')
2.5.3 If treated and untreated samples are shipped in separate containers, each container should be identified as such.
2.5.4 A completed Residue Sample Shipping Form must be placed inside each box.

2.6 When shipping with dry ice:

2.6.1 Insulated containers (boxes or coolers) must be used.
2.6.2 Boxes will be packed with dry ice in quantities sufficient to maintain sample integrity during shipment.
2.6.3 Dry ice should be packed in several locations within the container to maintain an even temperature, where possible.
2.6.4 Container lids and seams should be securely taped. Address labels must be covered with clear tape.
2.6.5 DOT approved hazardous (dry ice) shipping labels must be affixed to the exterior.

2.7 Sample shipping will be conducted by commercial overnight air service (FedEx or other comparable company) or by Agricultural Chemical Development Services (ACDS) freezer truck service. If necessary, arrangements will be made with the carrier for pick-up and shipment of the samples. Commercial overnight shipments should not be initiated after Wednesday to avoid weekend delivery.

SOP Number: UCR-60-1.8

Title: Freezers

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 The freezer thermostat should be set to maintain a temperature below 0^0 F (-18^0 C).

2.0 Verification and Temperature Monitoring

2.1 Approximately annually, the freezer operating temperature will be monitored with a NIST verified thermometer to confirm that the freezer is operating within parameters prescribed in the trial protocols. If a freezer is operating outside those parameters and the condition cannot be quickly remedied, Contingency Procedures outlined in Section 4.0 will be initiated.

2.2 Freezer temperatures will be monitored by a continuous temperature recording device and by a minimum/maximum thermometer as a backup. The min/max reading will be recorded in a log at regular intervals, weekly if possible and the thermometer will be reset at each recording.

3.0 Cleaning and Maintenance

3.1 Routine cleaning of the freezer is not considered necessary. On an approximate annual basis, usually during a period when field trials are completed for the season and the freezer can be decommissioned for a short time, the exterior and interior surfaces will be thoroughly cleaned with soap and water.

3.2 Maintenance required as a result of normal wear defines routine maintenance. No scheduled routine maintenance is required.

3.3 Maintenance required as a result of equipment malfunction, not normal wear, defines non-routine maintenance. In the event of non-routine repair, a record will be kept which will describe the nature of the defect, how and when the defect was discovered, and remedial action, if any, taken.

3.4 Testing Freezer Alarm and Notification System

- To be certain that the alarm and notification system is working properly, test the system for freezer malfunction and for power outage at least annually and preferably at additional intervals throughout the season or year when the freezers are empty. Test for both freezer malfunction and for power outages

when temperatures could rise above 10 degrees F. The alarm should sound, and messages should be sent to designated personnel (2 or more). The FRD will check to make sure that everyone on the list has received the message.

- Thoroughly document the testing in a log (e.g. freezer maintenance log) with information including the date of the test, temperature at which the alarm engaged, time(s) messages were received, and personnel contacted.

- If the system did not work properly in the test, complete repairs as soon as possible, document corrective actions and conduct a subsequent test to ensure the system is working.

4.0 Contingency Procedures

4.1 In the event of freezer malfunction as indicated by the thermometer alarm, a qualified service representative will be immediately summoned.

4.2 Check the temperature recorder to determine if damaging temperatures have occurred. Notify the Study Director and determine if the contents were damaged.

4.3 If contents are undamaged, transfer contents to another freezer immediately ensuring that they do not reach damaging temperatures during the transfer (i.e., use coolers if necessary to maintain cold temperature).

4.4 In the event of a power outage, take measures to ensure that a non-deviant temperature range is maintained (e.g., use dry ice or obtain a power generator). If a suitable temperature range cannot be maintained, follow the procedures in 4.2 and 4.3 above.

5.0 Responsible Personnel

5.1 Equipment inspection, cleaning (when required), and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-3.8

Title: Sprayer - R & D Backpack

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program

PROCEDURE:

1.0 Operation

1.1 Prior to calibration, a general inspection will be made of the sprayer for visual damage or potential problems. The spray system will then be operated to verify that the nozzles provide the desired pattern and that the pressure regulator is operating properly.

1.2 The spray system which consists of a CO_2 tank, valves, spray bottle, spray wand, and related hoses may be adapted to an assortment of application requirements and may either be hand carried or mounted on a variety of application equipment such as a bicycle sprayer, an all terrain vehicle (ATV), or a tractor.

1.3 Before operating the sprayer, the regulator valve should be set at the low pressure position before opening the CO_2 valve. The regulator valve can then be adjusted to the desired pressure.

1.4 Calibrated spray pressure and speed information shall be confirmed by the equipment operator prior to spraying. Actual spray pressure, RPM (if applicable), and speed during application will be recorded and should remain unchanged from calibration.

1.5 If the spray system is mounted on application equipment, the equipment will be timed through a test run in the test field prior to the application to verify speed. If the spray system is hand carried, the applicator will be timed through a test run in the test field, to confirm that travel time is accurate. Verification pass time will be recorded.

1.6 Each spray pass through the plot during the application will be timed and recorded to verify the actual application rate.

1.7 After use, the CO_2 valve should first be closed. If the sprayer is fitted with a pressure relief valve, the excess pressure should then be released from the spray system. The air supply hose should first be disconnected from the spray bottle, then the spray boom hose can be disconnected. This sequence will prevent the possibility of expulsion of spray solution from the spray bottle.

SOP Number: UCR-60-3.8

Title: Sprayer - R & D Backpack

2.0 Calibration

2.1 Calibration of the sprayer will occur or be verified prior to each use by a method which is accurate and reproducible. This method will be documented and may include, but not necessarily be limited to, the following:

2.1.1 Constant pressure will be set.

2.1.2 Discharge volume of liquid from each nozzle shall be measured and each individual measurement from 3 or more consecutive measurements shall not vary more than 5% from the average of all measurements. Any nozzle which varies greater than 5% should be cleaned or replaced. The discharge volume per unit of time will be used in the final calculations made to determine the actual application volume.

2.1.3 The sprayer speed shall be timed three times over a known distance, and each individual measurement shall not vary more than 5% from the average of 3 or more consecutive measurements.

2.2 If calibration occurs greater than one day prior to use, sprayer discharge must be verified and documented at least once, and must be within 5% of the calibrated value or the sprayer must be re-calibrated.

2.3 The method of mathematical calculations used will be the choice of the Field Research Director and shall be recorded in the raw data.

3.0 Cleaning

3.1 After use, and between treatments with different chemicals, the spray system will be thoroughly cleaned with water and when appropriate, a cleaning agent. After the system has been operated and thoroughly flushed, it will be thoroughly rinsed with clean water.

3.2 The spray apparatus exterior (tanks and boom) will be rinsed with clean water.

3.3 Exceptions to these cleaning requirements may include:

3.3.1 Equipment used in applying chemicals that may require specific solvents to remove chemical residues. In this case, cleaning methods must be thoroughly documented in the trial raw data.

3.4 For trials with multiple treatments of the same test substance at varying rates, applications should be made in order from the lowest to the highest treatment rate, in which case:

3.4.1 It will not be necessary to clean the spray system between treatments. The spray system can be completely drained and the next tank mix prepared. The next application should then proceed only after the boom has been fully charged.

3.4.2 It is preferable to use separate spray tanks. If separate spray tanks are used, all tank mix solution may be drained from the boom back into the spray tank and the boom connected to the next spray tank for application. The next application should then proceed only after the boom has been fully charged.

4.0 Maintenance

4.1 Maintenance required as a result of normal wear defines routine maintenance. Such maintenance, as needed, can include replacing worn regulator seals, quick connectors, nozzle parts, or tank gaskets.

4.2 Maintenance required as a result of equipment malfunction, not normal wear, defines non-routine maintenance. In the event of non-routine repair, a record will be kept which will describe the nature of the defect, how and when the defect was discovered, and remedial action, if any, taken. However, malfunction of a pressure regulator is considered a result of normal wear, and its repair is considered routine maintenance.

5.0 Contingency Procedures

5.1 If during the application of test substance an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. They will document the event in detail in the FDB including any actions taken subsequent to the event, demarcate the affected portion of the plot, and contact the Study Director to discuss the event's impact on the trial and subsequent courses of action. The equipment will be replaced or repaired and, if possible, the study will continue. An appropriate entry will be made in the equipment log describing any needed repairs.

6.0 Responsible Personnel

6.1 Equipment inspection, calibration, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

7.0 Records

7.1 A record of the dates of equipment inspection, calibration, maintenance, and cleaning will be kept in an equipment logbook. A check mark in the routine and non-routine box will give indication on whether it was a routine or non-routine action. Calibration results can be accessed by reference of the study number recorded in the Equipment Log at the time of these operations. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-4.6

Title: Temperature Measurement Instruments - Thermometers

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 Regardless of type, any temperature sensing instrument must be positioned in the target area in a location that is representative of the area and allowed sufficient time to equilibrate before reading.

1.2 If situated in an outdoor or greenhouse area, the instrument should be placed out of direct sunlight and with adequate ventilation to prevent absorbed or reflected heat from affecting its accuracy.

1.3 If present, minimum/maximum temperature indicators must be reset between readings.

2.0 Verification

2.1 Verification will be checked approximately once a year.

2.2 Verification will be checked against a NIST certified thermometer (certified within two years prior to the verification date) at two temperature reference points representing the expected range of use. The instruments should be allowed to equilibrate for at least 5 minutes before readings are taken and recorded for both test and reference thermometers at any reference point. If temperature variation from the certified thermometer is greater than 3 degrees, the thermometer should be replaced or adjusted, if possible.

3.0 Cleaning and Maintenance

3.1 The instrument will be cleaned when necessary.

3.2 No scheduled routine maintenance is required.

3.3 Non-routine maintenance should not be required. Thermometers which have been determined not to be functioning properly will be replaced.

4.0 Contingency Procedures

4.1 If during the generation, measurement, or assessment of data an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. Appropriate alternate equipment will be used if available, otherwise equipment will be replaced or repaired and, if possible, the study will continue. Documentation of

SOP Number: UCR-60-4.6

Title: Temperature Measurement Instruments - Thermometers

the malfunction shall be described in the study raw data and an appropriate entry made in the equipment log describing the repair.

5.0 Responsible Personnel

5.1 Equipment inspection, verification, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOP

SOP Number: UCR-60-6.7

Title: Electronic Temperature, Humidity and Wind Measuring Instruments

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 During measurement, the instrument should be shaded from direct sunlight.

1.2 The instrument should be operated for at least 5 minutes to allow readings to equilibrate before documenting displayed temperature and humidity results.

2.0 Verification

2.1 Instrument accuracy will be verified approximately once a year against two other similar instruments (such as kestrels). Temperature may also be verified against a NIST certified thermometer.

2.2 Temperature and humidity verification will be checked at two or more reference points representing the expected range of use. The instruments should be allowed to equilibrate for at least 5 minutes before readings are taken and recorded. If temperature or humidity varies more than 3 degrees or 5% from the average readings, respectively, the instrument should be replaced.

2.3 The wind meter will be verified by comparing at least three separate readings to at least 2 other similar instruments (such as a kestrel). If an instrument differs more than 0.5 miles per hour for wind readings at low speeds (<8 MPH), or 1 mile per hour for wind readings at high speeds (>8 MPH) from the average of all three instruments, it will be repaired or replaced.

3.0 Cleaning and Maintenance

3.1 The instrument will be cleaned when necessary.

3.2 Maintenance required as a result of normal wear defines routine maintenance. Other than replacing batteries when necessary, no scheduled maintenance is required.

3.3 Maintenance required as a result of equipment malfunction, not normal wear, defines non-routine maintenance. In the event of non-routine repair, a record will be kept which will describe the nature of the defect, how and when the defect was discovered, and remedial action, if any, taken.

SOP Number: UCR-60-6.7

Title: Electronic Temperature, Humidity and Wind Measuring Instruments

4.0 Contingency Procedures

4.1 If during the generation, measurement, or assessment of data an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. Appropriate alternate equipment will be used if available, otherwise the equipment will be replaced or repaired and, if possible, the study will continue. Documentation of the malfunction shall be described in the study raw data and an appropriate entry made in the equipment log describing the repair.

5.0 Responsible Personnel

5.1 Equipment inspection, verification, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-7.6

Title: Electronic Temperature Recording Instruments

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 The instrument is launched (set to record at specified intervals for a specified duration) via a computer connection, and battery status checked.

1.2 Unless auxiliary sensory probes are used, the instrument should be placed in a location representative of the area being monitored whenever possible.

1.3 Data will be downloaded on an approximate monthly schedule or as needed. At each download interval, data should be printed out and filed.

2.0 Verification

2.1 Verification will be checked approximately once a year.

2.2 Verification will be checked against a NIST certified thermometer at two temperature reference points representing the expected range of use.

2.3 The instrument will be launched and placed at the testing location Resulting data will be downloaded and compared to a NIST certified thermometer. If temperature variation from the reference thermometer is more than 3 degrees, the instrument should be replaced.

3.0 Cleaning and Maintenance

3.1 The instrument will be cleaned when necessary.

3.2 Maintenance required as a result of normal wear defines routine maintenance. Other than replacing batteries when necessary, no scheduled maintenance is required.

3.3 Maintenance required as a result of equipment malfunction, not normal wear, defines non-routine maintenance. In the event of non-routine repair, a record will be kept which will describe the nature of the defect, how and when the defect was discovered, and remedial action, if any, taken.

SOP Number: UCR-60-7.6

Title: Electronic Temperature Recording Instruments

4.0 Contingency Procedures

4.1 If during the generation, measurement, or assessment of data an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. Appropriate alternate equipment will be used if available, otherwise the equipment will be replaced or repaired and, if possible, the study will continue. Documentation of the malfunction shall be described in the study raw data and an appropriate entry made in the equipment log describing the repair.

5.0 Responsible Personnel

5.1 Equipment inspection, verification, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-8.4

Title: Weights (Verification)

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 Weights should be stored in a closed container and should be handled as carefully as possible.

1.2 The weight should be visually inspected prior to use to confirm that it is undamaged.

1.3 The weight will be placed on a weighing instrument that has been cleaned and tared.

1.4 The weighing instrument will first be allowed to stabilize, then the results recorded in the appropriate logbook.

2.0 Verification

2.1 Calibration weights will be verified on an approximately annual schedule by weighing them on a recently certified balance. Weights varying more than 1% from the certified balance will be considered defective and will be either repaired or replaced.

3.0 Cleaning and Maintenance

3.1 None required.

4.0 Contingency Procedures

4.1 If a weight is suspected to be faulty, it should be checked against another weight and replaced if necessary.

5.0 Responsible Personnel

5.1 Equipment inspection, verification, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-9.5

Title: Weighing Instruments

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 If the instrument is capable of reporting data in more than one type of unit of measurement (e.g. grams, ounces, grains), the measurement mode should be checked prior to use and adjusted if necessary.

1.2 The instrument must first be tared (set to zero) and the digital readout should be observed for any fluctuations which might indicate potential problems that may affect instrument performance, such as an improperly situated weighing plate or, for more sensitive instruments, air currents.

1.3 Once the instrument has been determined to be functioning properly, weighing may commence.

1.4 When weighing into a container, the instrument must again be reset to zero after the container has been placed on it and before weighing procedures begin.

2.0 Calibration

2.1 Certified calibration shall be performed on an approximate annual schedule by a qualified professional.

2.2 The scale will be verified, and calibrated if necessary prior to use. Verification will require weights that bracket the desired weight (e.g. 10g and 20g for weighing test substance of 16.5g). If the difference between the balance and the verified weights is greater than 1% for amounts 10g or over, or greater than 0.5% for amounts under 10g, then the balance should be adjusted in accordance with the instructions provided by the manufacturer. If a problem persists, the instrument shall be serviced by the factory service department or other qualified service personnel.

2.3 Non-GLP maintained scales/balances may be used to establish estimated residue sample weights in IR-4 GLP studies. A verification check will not be performed on these.

3.0 Cleaning and Maintenance

3.1 The instrument should be cleaned when necessary with water or soap/water solution.

SOP Number: UCR-60-9.5

Title: Weighing Instruments

3.2 Maintenance required as a result of normal wear defines routine maintenance. The following routine maintenance will be performed as necessary:

3.2.1 If present, batteries will be replaced when necessary.

3.3 Maintenance required as a result of equipment malfunction, not normal wear, defines non-routine maintenance. In the event of non-routine repair, a record will be kept which will describe the nature of the defect, how and when the defect was discovered, and remedial action, if any, taken.

4.0 Contingency Procedures

4.1 If during the generation, measurement, or assessment of data an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. The equipment will be replaced or repaired and, if possible, the study will continue. Documentation of the malfunction shall be described in the study raw data and an appropriate entry made in the equipment log describing the repair.

5.0 Responsible Personnel

5.1 Equipment inspection, verification, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

6.0 Records

6.1 A record of the dates of equipment inspection, calibration, verification, maintenance, and cleaning will be kept in an equipment logbook. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-11.1

Title: Borrowed or Rented Equipment

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Procurement Procedures

1.1 Contact the appropriate source for the equipment to be borrowed or rented.

1.2 If possible, acquire a copy of the operations manual.

2.0 Documentation

2.1 When available, the following information should be recorded for the equipment

2.1.1 Owner/Source
2.1.2 Description of equipment, e.g., type, make, model
2.1.3 Year manufactured
2.1.4 Year acquired
2.1.5 Proposed use of the equipment
2.1.6 Field ID, crop, and chemical for trial
2.1.7 Condition of equipment upon receipt
2.1.8 Maintenance performed
2.1.9 Modifications required
2.1.10 Cleaning/decontamination procedures performed
2.1.11 Field Research Director statement of suitability for use
2.1.12 Date of use

2.2 The person recording the information should initial and date entries

2.3 The information described above should be included in the appropriate IR-4 Field Data Book

SOP Number: UCR-60-12.2

Title: Pro Spray Skid Sprayer

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 Be familiar with equipment manuals, skid sprayer operation, and safety precautions before operating the skid sprayer.

2.0 Calibration

2.1 Calibrate the skid sprayer prior to use when the equipment is being used for a GLP test substance application.

2.2 Because spray output varies with respect to orifice size and engine speed, the applicator should determine the appropriate calibration or standardization method for each study. Three consecutive runs will be performed to determine total volume average. If an individual output run varies by more than 5% from the average of the three runs, another full calibration must be performed.

2.3 Fill tank with water.

2.4 Start engine and engage pump.

2.5 Set throttle to desired position.

2.6 Adjust nozzle orifice to desired spray pattern.

2.7 Spray out water according to calibration/standardization method determined in step 2.2. above. Start timing when water first leaves nozzle.

2.8 Stop spraying after a pre-determined time period.

2.9 Determine discharge rate and perform appropriate calculations to uniformly apply spray solution to the plot(s). Walking speed, time (e.g. seconds) per tree, time per area (ft^2), time per linear feet, are some variables that may be calculated from the specified calibration method.

3.0 Use

3.1 The spray solution may be mixed before placing in tank; make sure drain valve is closed.

SOP Number: UCR-60-12.2

Title: Pro Spray Skid Sprayer

3.2 Start engine and allow for warm up to full open choke. Check throttle speed and pressure gauge for correct setting. Confirm that hydraulic agitation is functioning.

3.3 Pull spray gun and hose into plot area. Check for intruders and potential drift.

3.4 Discharge sprayer outside of plot area about 2 minutes to charge hose. Perform spray passes determined in calibration. If fluid remains after completing all passes, completely discharge in a manner consistent with California state regulations. Minimize off-plot contamination.

3.5 To clean: open valve on the bottom of the tank and rinse and flush the tank for at least 5 minutes, pausing to let the tank empty more than once. Add more clean water after flushing and discharge the clean water through the hose and spray gun.

4.0 Maintenance

4.1 Maintain engine and pump following manual instructions.

4.2 Before each use, visually inspect hoses, pipes, fittings, valves, and tank for obvious wear and potential leaks. Replace and/or repair if needed.

4.3 In the event of failure or malfunction, consult the manuals and/or contact the manufacturer regarding repair or replacement.

5.0 Contingency Procedures

5.1 If during the application of test substance an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. They will document the event in detail in the FDB including any actions taken subsequent to the event, demarcate the affected portion of the plot, and contact the Study Director to discuss the event's impact on the trial and subsequent courses of action. The equipment will be replaced or repaired and, if possible, the study will continue. An appropriate entry will be made in the equipment log describing any needed repair.

7.0 Responsible Personnel

7.1 Equipment inspection, calibration, cleaning, and maintenance (routine and non-routine) shall be performed or supervised by the Field Research Director.

8.0 Records

8.1 A record of the dates of equipment inspection, calibration, maintenance, and cleaning will be kept in an equipment logbook. A check mark in the routine and non-routine box will give indication on whether it was a routine or non-routine action. Calibration results can be accessed by reference of the study number recorded in

the Equipment Log at the time of these operations. Records will be archived according to UCR IR-4 SOPs.

SOP Number: UCR-60-13.1

Title: Flowmeter

PURPOSE: To assure that equipment utilized for the generation, measurement, or assessment of GLP data is properly operated and maintained.

SCOPE: Applies to all research trials conducted through the University of California, Riverside IR-4 Program.

PROCEDURE:

1.0 Operation

1.1 The instrument is turned on by depressing the on button which displays current total.

1.2 To reset current total to 0.0 press and hold for 2 seconds the reset button. This allows measurement for a single use.

1.3 To display the cumulative total press and hold down the button that says Total 2.

2.0 Equipment Verification

2.1 Flowmeter will be verified prior to each application by metering water through the flowmeter into a calibrated container to the 5-gallon mark. If the readout indicates a variation of 5% or more (or ~950 ml.), the flowmeter will be repaired (as below) or replaced. Containers used for verification will be confirmed either volumetrically with graduated cylinders or gravimetrically on a calibrated scale.

3.0 Cleaning and Maintenance

3.1 Flowmeters are only used for metering water and do not require cleaning.

3.2 Maintenance required as a result of normal wear defines routine maintenance. Other than replacing worn seals and batteries on an as needed basis, no scheduled maintenance is required, and no other maintenance will be done. If the flowmeter is not working after replacing batteries and seals, it will be replaced.

4.0 Contingency Procedures

4.1 If during the generation, measurement or assessment of data, an equipment malfunction occurs, the supervising personnel shall be advised of the malfunction. The equipment will be replaced or repaired and, if possible, the study will continue. Documentation of the malfunction shall be described in the study raw data and an appropriate entry made in the equipment log describing the repair.

5.0 Responsible Personnel

5.1 Equipment inspection, verification and maintenance shall be performed or supervised by the Field Research Director.

SOP Number: UCR-60-13.1

Title: Flowmeter

6.0 Records

6.1 A record of the dates of equipment inspection, verification, and maintenance will be kept in an equipment log.