IR-4 National Education Conference
February 25-26, 2020
Bahia Resort Hotel, San Diego, CA

Round Table Discussion – Field Session Day 2 AM (10:30-Noon)

Organizers: Michael Chen, Marylee Ross, Janine Spies

Topics were assigned to ten tables and participants (5-8 per table) were asked to discuss and prepare a summary to report to all. These topics were developed based on responses from previous surveys and feedback from IR-4 personnel. The topics integrated aspects from study protocols, SOPs and Field Databooks and were designed in a way to prompt responses that included recommendations for improvement and greater efficiency. Topics included 1) discharge calibrations, 2) greenhouse applications, 3) seed treatments, 4) post-harvest applications, 5) conducting non-typical trials, 6) documenting phytotoxicity, 7) sample drying procedures, 8) planning for the season, 9) sample modification, and 10) test substance measurements. Two additional topics (soil sampling and sample shipment) were prepared as back-ups if more were needed but were ultimately not discussed.

Outcome: The feedback that the organizers received from participants was positive. The majority of the discussions generated from the topics were productive and the prepared summaries were thorough. There were a few topics that were either not given enough context/not all the appropriate materials were provided (seed treatment topic) or the question being asked was too specific and not appropriate for the venue (calculations for post-harvest application). Otherwise, the small groups and detailed topics were conducive for intimate, productive discussion. There was also enough time to allow each group to share their summaries with the entire field session. In the future, in order to better synthesize the recommendations that were generated from these discussions, it would be beneficial to add an additional 30-45 minute session after a coffee break or lunch to allow participants to comment on other groups summaries. We believe this would better actualize our goal of creating action items at NEC and applying recommendations to improve IR-4 operations.

Topic and summaries:

# TABLE 1

# Discharge Calibration

| NAME | SIGNATURE |
|---|---|
| Laurie Ridgeway | |
| Blaine Turner | |
| Kathleen Feist | |
| Monique Hemker | |
| Thomas Freiberger | |
| Joseph Goodrich | |
| Allison Robinson | |
| Paul Wade | |
| Ken Samoil | |
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Discharge Calibrations

Scenario: Part 14.2 of protocol explains discharge calibration requirements. There are multiple Field data Book pages available for use depending on the type of application the Field Research Director will be making. How does the FRD determine the method to use to calibrate? Is it necessary to perform a complete 3-run calibration or can a recheck be done? Is it a target output? What is the appropriate FDB page to use? Can a customized or computer-generated page be used? Are there other issues to think about?

Please keep in mind that several significant changes are proposed for the 2021 FDB. Proposed changes to discharge calibration pages have been provided and feedback is strongly encouraged.

Pages included for consideration during discussion:

- **Protocol** section for discharge calibration – 2019 version and revisions for 2020 version
- 2020 **Standard** 2 page **discharge calibration** form and proposed revisions for 2021 (combining 2 pages into 1)
- Proposed new page for **Target Check** discharge calibration for 2021(removing it from the standard form)
- 2020 version 2 page discharge calibration **AIRBLAST SPRAYER** and proposed revisons for 2021(combining 2 pages into 1)
- 2020 Optional **Horizontal discharge calibration form** and proposed revisions for 2021
- Example SOP.

2019 Protocol page

**14.2 Full Calibrations for output and speed must be performed to ensure accurate delivery.**
A calibration consists of a minimum of 3 consecutive, documented checks for nozzle or hopper output and speed (equipment or walking speed). An output calibration is a 3 run discharge of all the nozzles. An output recheck is a single run discharge of all the nozzles. A speed calibration is 3 runs. A speed recheck is a single run. (When the output of an airblast sprayer is calibrated or rechecked, it is not necessary to record the outputs of individual nozzles.)

**Verification** of the actual amount of test substance applied will always be made using **the most recent complete calibration data for that equipment.** (Note: When the most recent calibration data is from another trial, a certified true copy of that data must be included in the field data book for this trial.)

**Discharge/Output Calibrations:**

Is this the first application of test substance in this trial?

**YES:** A full calibration is required just prior to the first application (allowable the day before the application, but calibration on the day of use is preferred).

**NO:** A single run recheck may be conducted to confirm consistent delivery (within ±5% of the last complete calibration) just prior to subsequent applications. (Full calibrations are preferred.)

**Recheck is required when:**

1. Full calibration data from another trial is used.
2. The equipment has been moved from the location where the most recent full calibration or recheck has occurred. (A sprayer that has been calibrated or rechecked at a farm or research station and then used to make an application somewhere else on that same farm or research station is *not* considered to have been "moved".)
3. The equipment has been cleaned.
4. Nozzles are removed and placed back on.
5. $CO_2$ tank has been changed.

**Recheck is not required when** the same Field Research Director is making applications on the same day for multiple trials in this study, or multiple treatments in the same trial, unless there have been changes in other application parameters as described above.

**Full output calibration is required if:**

1. This is the first application in the trial
2. Application parameters or equipment components have changed (other than changing out $CO_2$ tanks) including:
    a. Nozzle or hopper output
    b. Nozzle size or type (full output calibration is not required if the same, clearly identified nozzles used for the full calibration have been placed back in the same positions on the boom after other nozzles have been used for another trial; in this case, only a recheck is needed)
    c. Change in delivery pressure by more than 5% (even if it has been changed back to the pressure used during the initial calibration UNLESS the pressure change is accomplished by replacing the regulator, and the screw on the regulator used in this trial has not been turned since the full calibration)
3. A recheck is not within ±5% of the last complete calibration.
4. The discharge of any single nozzle during a run of a full calibration or a recheck is greater than ±5% of the mean of the same run (this does not apply to airblast sprayers). If this occurs the nozzle must be adjusted or replaced, and a full calibration must be conducted to ensure that the nozzle discharge is within 5% of the mean and to determine a new output.

**Target outputs:** The use of a target output rather than the mean output may be used in the calculations made prior to the application; however, a "target check" calibration consisting of three runs must be conducted just prior to each use of a target output, and the mean output must be within 5% of the target output. Using a target output rather than a mean output increases the probability that an application rate deviation will occur. Verification of the amount of test substance that has been applied in calculations that use the discharge rate will always be made using the most recent calibration data.

**14.2 Full Calibrations for output and speed must be performed to ensure accurate delivery.**
A calibration consists of a minimum of 3 consecutive, documented checks for nozzle or hopper output and speed (equipment or walking speed). An output calibration is a 3 run discharge of all the nozzles. An output recheck is a single run discharge of all the nozzles. A speed calibration is 3 runs. A speed recheck is a single run. (When the output of an airblast sprayer is calibrated or rechecked, it is not necessary to record the outputs of individual nozzles.)

**Verification** of the actual amount of test substance applied will always be made using **the most recent complete calibration data for that equipment.** (Note: When the most recent calibration data is from another trial, a certified true copy of that data must be included in the field data book for this trial.)

**Discharge/Output Calibrations:**

Is this the first application of test substance in this trial?

**YES:** A full calibration is required just prior to the first application (allowable the day before the application, but calibration on the day of use is preferred). A single, full calibration may be used for multiple trials in the same study or multiple studies if the following conditions are met:
1. The first application in each trial is the day of the calibration or the following day.
2. Application parameters and equipment components remain the same for each of the trials.
3. A recheck is run in each of the trials after the first.

**NO:** A single run recheck may be conducted to confirm consistent delivery (within ±5% of the last complete calibration) just prior to subsequent applications. (Full calibrations are preferred.)

**Recheck is required when:**
~~1. Full calibration data from another trial is used.~~
~~2.~~1. The equipment has been moved from the location where the most recent full calibration or recheck has occurred. (A sprayer that has been calibrated or rechecked at a farm or research station and then used to make an application somewhere else on that same farm or research station is *not* considered to have been "moved".)
~~3.~~2. The equipment has been cleaned.
~~4.~~3. Nozzles are removed and placed back on.
~~5.~~4. $CO_2$ tank has been changed.

**Recheck is not required when** the same Field Research Director is making applications on the same day for multiple trials in this study or separate studies, or multiple treatments in the same trial, unless there have been changes in other application parameters as described above.

**Full output calibration is required if:**
1. This is the first application in ~~the~~ this trial
2. Application parameters or equipment components have changed (other than changing out $CO_2$ tanks) including:
   a. Nozzle or hopper output
   b. Nozzle size or type (full output calibration is not required if the same, clearly identified nozzles used for the full calibration have been placed back in the same positions on the boom after other nozzles have been used for another trial; in this case, only a recheck is needed)
   c. Change in delivery pressure by more than 5% (even if it has been changed back to the pressure used during the initial calibration UNLESS the pressure change is accomplished by replacing the regulator, and the screw on the regulator used in this trial has not been turned since the full calibration)
3. A recheck is not within ±5% of the last complete calibration.
4. The discharge of any single nozzle during a run of a full calibration or a recheck is greater than ±5% of the mean of the same run (this does not apply to airblast sprayers). If this occurs the nozzle must be adjusted or replaced, and a full calibration must be conducted to ensure that the nozzle discharge is within 5% of the mean and to determine a new output.

**Target outputs:** The use of a target output rather than the mean output may be used in the calculations made prior to the application; however, a "target check" calibration consisting of three runs must be conducted just prior to each use of a target output, and the mean output must be within 5% of the target output. Using a target output rather than a mean output increases the probability that an application rate deviation will occur. Verification of the amount of test substance that has been applied in calculations that use the discharge rate will always be made using the most recent calibration data.

REVISIONS - FOR 2020

FIELD ID NO: _____

# IR-4 FIELD DATA BOOK

## PART 6. APPLICATION RECORDS

Standard form

C.1. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER** ____

*INSTRUCTIONS: Complete a copy of this form (PHOTOCOPY IF NECESSARY) for additional times when a complete calibration or calibration-recheck of application equipment is required.*

EQUIPMENT IDENTIFIER_____

DISCHARGE CALIBRATION DATE_____ PERFORMED BY_____ *(INITIALS)*

APPROXIMATE TIME OF DAY THAT THE CALIBRATION WAS PERFORMED_____

LOCATION WHERE THE CALIBRATION WAS PERFORMED_____

INSTRUMENT USED TO MEASURE WATER *(e.g. 100 ml graduated cylinder)* _____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION _____

_____

_____

_____

_____

_____

_____

**Instructions for recording Discharge Calibrations (6.C.2):** *Record time that applicator discharges and units measured. Collect output from each nozzle or hopper. Record this value in "RUN" column next to the appropriate outlet. Calculate the total and average discharge for all the nozzles/outlets. Entry prompts have been provided for three discharge calibration runs. For each run, calculate the total output of all nozzles/outlets, the mean output per nozzle or outlet, the nozzle or outlet discharge rate, and the total boom discharge rate in ml or grams per second. Also confirm whether the output of each nozzle or outlet during a run is within 5% of the mean output. If a recheck or confirmation of a target output is being performed, determine whether the results are within 5% of the full calibration or target. Enter all calculations on 6.C.1, below.*

CALIBRATION CALCULATIONS:

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2020

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FIELD ID NO: _____

# IR-4 FIELD DATA BOOK

## PART 6. APPLICATION RECORDS

C.2. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER** ____ Standard form

*INSTRUCTIONS: Complete a copy of this form (PHOTOCOPY IF NECESSARY) for additional times when a complete calibration or calibration-recheck of application equipment is required.*

| Output Run Number | | 1 | 2 | 3 | Total (Required) | Average (Optional) |
|---|---|---|---|---|---|---|
| Pressure (psi) | | | | | | |
| Units (e.g. ml, grams) | | | | | | |
| Time (seconds) | | | | | | |
| Nozzle/Hopper Outlet Number Along Boom (These numbers should match those shown in the equipment diagram in 6.B) | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |
| | 7 | | | | | |
| | 8 | | | | | |
| | 9 | | | | | |
| | 10 | | | | | |
| | 11 | | | | | |
| | 12 | | | | | |
| Total Boom Volume (sum of nozzle/outlet outputs) | | | | | | |
| Mean per nozzle or outlet (ml or g) | | | | | | |
| Discharge rate* (Total boom volume/time OR Mean nozzle volume/time in ml or g/second) | | | | | | |

*Indicate whether discharge rate is calculated for: *(Check one)* Total Boom Volume____ Mean Nozzle Volume_____

Was this a recheck of discharge calibration or a 3-run target check? *(Check one)* YES____ NO_____

If yes, were results within 5% of original calibration or target output? YES____ NO_____

If this is a 3-discharge calibration run or a 3-run target check, is each boom discharge rate (bottom row in columns 1, 2, and 3) within 5% of the mean? YES____ NO_____ NA_____

Are individual nozzle outputs within 5% of the mean during each run? YES____ NO_____ NA_____

*An output consisting of an average of three runs or a target output may be used when calculating the sprayer output and amount of test substance to use. If this is a recheck (one run) then the results of the original calibration must be used. If the output result of the recheck is more than 5% different than the original calibration result, then two more runs are needed to produce a new, full calibration. The original calibration data, or a true copy, must be in this field data book.*

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2020

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FIELD ID NO: _____ Standard form

# IR-4 FIELD DATA BOOK

Combined C.1. and C.2.

## PART 6. APPLICATION RECORDS

C. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER** ____

*INSTRUCTIONS: Use this form when conducting full (3-run) calibrations or rechecks. If conducting a recheck, please provide calculations to verify that the output is within +/-5% of the most recent full calibration.*

***If you are conducting a 3-run target check, please use the 3-run target check form provided on the IR-4 website.***

EQUIPMENT IDENTIFIER_____

DISCHARGE CALIBRATION DATE _____ TIME_____ PERFORMED BY_____ *(INITIALS)*

LOCATION WHERE THE CALIBRATION WAS PERFORMED _____

INSTRUMENT USED TO MEASURE WATER *(e.g. 100 ml graduated cylinder)*_____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION_____

_____

_____

_____

PRESSURE (psi) _____ UNITS (e.g. ml, grams) _____

| Output Run Number | | 1 | 2 | 3 | |
|---|---|---|---|---|---|
| Nozzle/Hopper Outlet Number Along Boom *(If more than 6 nozzles, use the alternate form Part-6C. Large Boom provided on the website.)* | 1 | | | | |
| | 2 | | | | |
| | 3 | | | | |
| | 4 | | | | |
| | 5 | | | | |
| | 6 | | | | Total |
| Total Boom Volume | | | | | A |
| Mean per nozzle or outlet | | | | | B |
| Time (seconds) | | | | | C |
| Discharge Rate | | | | | Average Discharge Rate* D _____ |

Is this a recheck?

Yes _____

No _____

Indicate whether discharge rate is calculated for: Total Boom Volume____ Mean Nozzle Volume_____ *(A or B)/C=D

Is the discharge rate of each run within 5% of the mean? YES____ NO_____ NA_____

Are individual nozzle outputs within 5% of the mean during each run? YES____ NO_____ NA_____

If this is a recheck, are results within 5% of original output? YES____ NO_____ NA_____

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2021

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New page

FIELD ID NO: _____

# IR-4 FIELD DATA BOOK

## PART 6. APPLICATION RECORDS (may be used in field and greenhouse trials)

C. DISCHARGE CALIBRATION **(TARGET CHECK)** FOR **APPLICATION NUMBER** ____

*INSTRUCTIONS:* ***Use this form only when conducting 3-run checks of a target output rate.***
**Calculations that do not fit on this page should be inserted on an additional page.**

EQUIPMENT IDENTIFIER_____

DISCHARGE CALIBRATION DATE _____ TIME_____ PERFORMED BY_____ *(INITIALS)*

LOCATION WHERE THE CALIBRATION WAS PERFORMED _____

INSTRUMENT USED TO MEASURE WATER *(e.g. 100 ml graduated cylinder)*_____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION_____

_____

_____

_____

PRESSURE (psi) _____ UNITS (e.g. ml, grams) _____

*The use of a target output rather than the mean output may be used in the calculations made prior to the application; however, a "target check" calibration consisting of three runs must be conducted just prior to each use of a target output, and the mean output must be within 5% of the target output.* ***After the application has been completed, the calculation of the amount of test substance that has been applied must use the mean output of this 3-run check, rather than the target output that was used in the advance calculations.***

| Output Run Number | | 1 | 2 | 3 | |
|---|---|---|---|---|---|
| Nozzle/Hopper Outlet Number Along Boom *(If more than 6 nozzles, use the alternate form provided on the website.)* | 1 | | | | |
| | 2 | | | | |
| | 3 | | | | |
| | 4 | | | | |
| | 5 | | | | |
| | 6 | | | | Total |
| Total Boom Volume | | | | | A |
| Mean per nozzle or outlet | | | | | B |
| Time (seconds) | | | | | C |
| Discharge Rate | | | | | Average Discharge Rate* D _____ |
| Target Discharge Rate | | | | | E |
| Average Discharge Rate (D) divided by Target Discharge Rate (E) | | | | | |

Indicate whether discharge rate is calculated for: Total Boom Volume____ Mean Nozzle Volume_____ *(A or B)/C=D

Is the discharge rate of each run within 5% of the mean? YES____ NO_____ NA_____

Are individual nozzle outputs within 5% of the mean during each run? YES____ NO_____ NA_____

If this is a recheck, are results within 5% of target output? YES____ NO_____ NA_____

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2021

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# IR-4 FIELD DATA BOOK

## PART 6. APPLICATION RECORDS-AIRBLAST SPRAYER

C. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER ___**

*INSTRUCTIONS: Complete a separate form for additional times when a complete calibration or calibration-recheck of application equipment is required.*

EQUIPMENT IDENTIFIER_____

DISCHARGE CALIBRATION DATE_____ PERFORMED BY_____ *(Initials)*

PRESSURE OR OTHER STANDARD SETTING UTILIZED IN CALIBRATION_____

APPROXIMATE TIME OF DAY THAT THE CALIBRATION WAS PERFORMED_____

LOCATION WHERE THE CALIBRATION WAS PERFORMED_____

STANDARD DISTANCE USED IN DISCHARGE CALIBRATION_____

DISCHARGE UNITS MEASURED *(e.g. ml, oz., gallons)* _____

METHOD USED TO DETERMINE AMOUNT DISCHARGED *(Check one)* REFILLED WITH FLOWMETER_____

MEASURED AMOUNT NEEDED TO BACKFILL TANK____ OTHER *(Describe below)* _____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION _____

_____

_____

**The table for entering output results is now on 6.C.2 (next page).**

CALIBRATION CALCULATIONS:

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# IR-4 FIELD DATA BOOK

## PART 6. APPLICATION RECORDS AIRBLAST

C.2. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER** ____

*INSTRUCTIONS: Complete a copy of this form (PHOTOCOPY IF NECESSARY) for additional times when a complete calibration or calibration-recheck of application equipment is required.*

DISCHARGE CALIBRATION *Record time applicator is allowed to discharge. Record this value in "RUN" Row 1 next to the appropriate side. Calculate the total and average discharge AND whether the recheck is within 5% (if applicable). Entry prompts have been provided for 3 discharge calibration runs. Enter all calculations on 6.C.1.*

| Output Run Number | | 1 | 2 | 3 | Total (Required) | Average (Optional) |
|---|---|---|---|---|---|---|
| Pressure (psi) | | | | | | |
| Units (e.g. ml, liters, gallons) | | | | | | |
| Time (seconds) | | | | | | |
| Left side* only | Initial volume | | | | | |
| | Final volume | | | | | |
| | Volume discharged | | | | | |
| Right side* only | Initial volume | | | | | |
| | Final volume | | | | | |
| | Volume discharged | | | | | |
| Both sides at the same time | Initial volume | | | | | |
| | Final volume | | | | | |
| | Volume discharged | | | | | |
| Sum of outputs per run (ml or gallons) | | | | | | |
| Total discharge rate (ml or gal/sec) | | | | | | |

*As seen from the rear of the sprayer

Was this a recheck of discharge calibration or a 3-run target check? *(Check one)* YES____ NO_____

If yes, were results within 5% of original calibration or target output? YES____ NO_____

If this is a 3-discharge calibration run or a 3-run target check, is each boom discharge rate (bottom row in columns 1, 2, and 3) within 5% of the mean? YES____ NO____ NA____

*An output consisting of an average of three runs or a target output may be used when calculating the sprayer output and amount of test substance to use. If this is a 1-discharge recheck, then the results of the original calibration must be used. If the output result of the recheck is more than 5% different than the original calibration result, then two more runs are needed to produce a new, full calibration. The original calibration data, or a true copy, must be in this field data book.*

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2020

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# IR-4 FIELD DATA BOOK

Combined C and C.2.

## PART 6. APPLICATION RECORDS-AIRBLAST SPRAYER

C. DISCHARGE CALIBRATION FOR **APPLICATION NUMBER** ____

*INSTRUCTIONS: Use this form when conducting full (3-run) calibrations or rechecks. If conducting a recheck, please provide calculations to verify that the output is within +/-5% of the most recent full calibration.* **Calculations that do not fit on this page should be inserted on an additional page.**

***If you are conducting a 3-run target check, please use the target check form provided on the IR-4 website.***

EQUIPMENT IDENTIFIER_____

DISCHARGE CALIBRATION DATE_____ PERFORMED BY_____ *(Initials)*

APPROXIMATE TIME OF DAY THAT THE CALIBRATION WAS PERFORMED_____

LOCATION WHERE THE CALIBRATION WAS PERFORMED_____

STANDARD DISTANCE USED IN DISCHARGE CALIBRATION_____

PRESSURE (psi) _____ DISCHARGE UNITS MEASURED *(e.g. ml, gallons)* _____

METHOD USED TO DETERMINE AMOUNT DISCHARGED *(Check one)* REFILLED WITH FLOWMETER_____

MEASURED AMOUNT NEEDED TO BACKFILL TANK____ OTHER *(Describe below)* _____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION _____

_____

_____

| | Output Run Number | 1 | 2 | 3 | Is this a recheck? |
|---|---|---|---|---|---|
| Left side* only | Initial volume | | | | Yes _____ |
| | Final volume | | | | |
| | Volume discharged | | | | No _____ |
| Right side* only | Initial volume | | | | |
| | Final volume | | | | |
| | Volume discharged | | | | |
| Both sides at the same time | Initial volume | | | | |
| | Final volume | | | | |
| | Volume discharged | | | | Total |
| Sum of outputs per run (ml or gallons) | | | | | A |
| Time (seconds) | | | | | B |
| Discharge rate (ml or gal/sec) | | | | | Avg. Discharge Rate** C |

*As seen from the rear of the sprayer

**A/B=C

If this is a recheck, are results within 5% of original output? YES____ NO_____

Is the discharge rate of each run within 5% of the mean? YES____ NO____ NA____

ABOVE DATA ENTERED BY: _____ DATE: _____

PART 6 PAGE ___ Trial Year 2021

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DRAFT

PART 6. APPLICATION RECORDS (may be used for field and greenhouse trials)

EQUIPMENT USED FOR **APPLICATION NUMBER(S)** _____

C2. *INSTRUCTIONS: Complete a copy of this form (PHOTOCOPY IF NECESSARY) for additional times when a complete calibration or calibration-recheck of application equipment is required.*

Units measured (eg. mL, grams): _____

| RUN | TIME (sec) | PSI: Pressure in the boom during the calibration | Nozzle/hopper outlet number along boom (see equipment diagram for nozzle #s): 1 | 2 | 3 | 4 | 5 | 6 | Total boom volume (sum of nozzle or outlet outputs) | Mean per nozzle or outlet (ml or g) | Discharge rate* (Total boom volume/time OR Mean nozzle volume/time in ml or g/second) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| Total (required) | | | | | | | | | | | |
| Average (optional) | | | | | | | | | | | |

FIELD ID NO: _____

IR-4 FIELD DATA BOOK

*Indicate whether discharge rate is calculated for: *(Check one)* Total Boom Volume____ Mean Nozzle Volume_____

Was this a recheck of discharge calibration or a 3-run target check? *(Check one)* YES_____ NO_____

If yes, were results within 5% of original calibration or target output? YES_____ NO_____

If this is a 3-discharge calibration run or a 3-run target check, is each boom discharge rate (far right column in rows 1, 2, and 3) within 5% of the mean? YES_____ NO_____ NA_____

Are individual nozzle outputs within 5% of the mean during each run? YES_____ NO_____ NA_____

*An output consisting of an average of three runs or a target output may be used when calculating the sprayer output and amount of test substance to use. If this is a recheck (one run) then the results of the original calibration must be used. If the output result of the recheck is more than 5% different than the original calibration result, then two more runs are needed to produce a new, full calibration. The original calibration data, or a true copy, must be in this field data book.*

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2020

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PART 6. APPLICATION RECORDS (may be used in field and greenhouse trials for calibrations, rechecks, and target checks)

EQUIPMENT USED FOR **APPLICATION NUMBER(S)** _____

C. *INSTRUCTIONS: If conducting a recheck, please provide calculations to verify that the output is within +/-5% of the most recent full calibration.*

**Calculations that do not fit on this page should be inserted on an additional page.**

EQUIPMENT IDENTIFIER _____

DISCHARGE CALIBRATION DATE _____ TIME _____ PERFORMED BY _____ *(INITIALS)*

LOCATION WHERE THE CALIBRATION WAS PERFORMED _____

INSTRUMENT USED TO MEASURE WATER *(e.g. 100 ml graduated cylinder)* _____

BRIEFLY DESCRIBE PROCEDURE USED TO CHECK DISCHARGE CALIBRATION _____

_____

PRESSURE (psi) _____ UNITS (e.g. ml, grams) _____

| RUN | Nozzle/hopper outlet number along boom (see equipment diagram for nozzle #s) | | | | | | Total boom volume | Mean per nozzle or outlet | Time (sec) | Discharge rate* |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | |
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| | | | | | | Total | A | B | C | Average Discharge rate** D |

Is this a 1-run recheck?[1] Yes _____ No _____

Is this a 3-run target check?[1] Yes _____ No _____

*Indicate whether discharge rate is calculated for: Total Boom Volume____ Mean Nozzle Volume_____ **(A or B)/C=D

[1]If yes, were results within 5% of original calibration or target output? YES_____ NO_____

If this is a 3-discharge calibration run or a 3-run target check, is each boom discharge rate (far right column in rows 1, 2, and 3) within 5% of the mean? YES_____ NO_____ NA_____

Are individual nozzle outputs within 5% of the mean during each run? YES_____ NO_____ NA_____

ABOVE DATA ENTERED BY: _____ DATE: _____



Trial Year 2021

COMPLETE IF APPROPRIATE: "THIS IS A TRUE COPY OF THE ORIGINAL"
THE ORIGINAL IS IN IR-4 FIELD DATA BOOK NO. _____ INITIALS _____ DATE _____

IR-4 FIELD DATA BOOK FIELD ID NO: _____

DRAFT

**SOP #6.2** **Calibration of a $CO_2$ backpack sprayer**

PURPOSE: To determine the delivery rate of sprayer and make adjustments as necessary to ensure an accurate application of the test substance.

SCOPE: All GLP trials where a backpack sprayer is used

PROCEDURES:

1. Visually inspect hoses, pipes, fittings, regulators, gauges, and tanks for obvious wear or potential leaks and repair or replace as necessary.

2. Determine whether all nozzles are discharging uniformly by spraying water through them at a uniform pressure and catching the discharge from each nozzle in a separate container for a given length of time such as the time it will take to make one pass over the plot. Begin by timing with a stopwatch; collection of the discharge after the system is primed and operating. Measure the discharge from each nozzle in a graduated cylinder of appropriate increments. If the discharge varies widely, replace all nozzle tips with variation of greater than 5% from the mean output of all nozzles. Variation among nozzle tips shall be less than 5%. Repeat the above procedure until all nozzles are discharging uniformly.

3. All sprayers used for GLP trials shall have a pressure gauge. Observe the pressure reading when uniform discharge from all nozzles is achieved. Record the pressure.

4. Measure out the length of the test plot and clearly mark the 2 ends of that distance with a flag or other such marker. Establish a comfortable, safe pace to walk that distance with the backpack equipment and spray tank. Make several practice runs and measure the pass times with a stopwatch. Record the time it takes to travel that distance at the desirable pace.

5. Collect discharge from all nozzles at the recorded pressure for the amount of time it took to travel the distance. The amounts collected will be measured in a graduated cylinder. Record the discharge from each nozzle in milliliters. Add the amounts for total discharge. A longer time may be used if the distance is small for ease and accuracy of calculations.

6. Do mathematical calculations to convert area to be treated to portion of an acre.

7. Choose a rate at which to spray within protocol specifications.

8. Calculate amount of mix needed to spray the area to be treated. (Example: 34 gallons/acre = X gallons/treated area) Add sufficient amount extra to accommodate spray hoses, etc. and achieve the amount of mix necessary to assure coverage of entire treated area.

9. Calculate the amount of test substance to add to water. Calculations vary depending on application type. Calculations shall be shown on Part 6 F of the Field Data Book.

# Table 1

## Calibrations

How does FED determine method to use to calibrate
- determine equipment needed / soil / foliar
- consider GPA
- dry vs liquid

What does protocol say.

Some do 3-run check as re-check - do same thing every time reduce chance making error

Single re-check good for those travel a lot
Single re-check saves time

Some do only 1 Ap/day ∴ do full 3-run calibration ea. day

How to determine "Target" output
"Target" - goal is GPA range in protocol

Use initial discharge rate determined as value used in all calculations regardless of single run re-check vs 3 run recheck.

Multiple Aps - can change GPA as long as w/i range specified in protocol - as long as a 3-run check is performed

Calibrations

FRD can create custom computer generated page - good to do prior to season.
can EXCEL spreadsheet & include in FDB incl. statement "I have verified above is correct"

Need to have SOP for computer program

Can use excel to double-check your calculations but then don't have to include that EXCEL spreadsheet in FDB.

For drench - do measure back to calculate actual amount on plot.

***Topic #1 Discharge Calibrations - Response summary***

Scenario – Part 14.2 of protocol explains discharge calibration requirements. There are multiple Field data book pages available for use depending on the type of application the Field Research Director will be making. How does the FRD determine the method to use to calibrate? Is it necessary to perform a complete 3-run calibration or can a recheck be done? Is it a target output? What is the appropriate FDB page to use? Can a customized or computer-generated page be used? Are the other issues to think about?

**How does FRD determine method to use to calibrate?**

- Determine equipment needed (i.e., soil, foliar);
- Consider GPA
- Test substance dry vs. liquid
- Consider what the protocol says

**3-run calibration vs. single recheck:**

- Some do 3-run check as a re-check – doing the same thing every time reduces the chance of making an error.
- Single re-check is a good option for those travelling a lot – single re-check saves time.
- Some do only 1 application/day and therefore do a full 3-run calibration each day.

**How to determine "target" output:**

- Check Target GPA range in protocol
- Use the initial discharge rate determined as the value used in all calibrations regardless if a single run recheck vs. 3 run recheck.
- Multiple applications - GPA can change as long as range specified in protocol and/or as long as a 3-run check is performed.

**Can FRD create custom computer generated pages for calibrations**:

- Good to do prior to season
- Can use EXCEL spreadsheet and include in FDB including statement "I have verified above is correct." Need to have SOP for computer program.
- Can use EXCEL to double-check your calculations but then don't have to include that EXCEL spreadsheet in FDB.

*For drench, do measure back to calculate amount on plot.

# TABLE 2

# Greenhouse

| NAME | SIGNATURE |
|---|---|
| Tristan Jobin | |
| David Ennes | |
| Blair Harlan | |
| Leona Horst | |
| Christina Marconi | |
| Scott Chapman | |
| Alvin Simmons | |
| Jane Forder | |
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Topic on Greenhouse trials.

Scenarios:

A greenhouse was technically a test system care facility where treated/untreated crops were kept. Per 40 CFR 160.43, it should "… have a sufficient number of animal rooms or other test system areas, as needed, to ensure: proper separation…. (e) Facilities should have provisions to regulate environmental conditions (e.g., temperature, humidity, photoperiod) as specified in the protocol. (h) For plants, an adequate supply of soil of the appropriate composition, as specified in the protocol, shall be available as needed. Per 40 CFR 160.45 – Test system supply facilities, "there should be storage areas, as needed, for … soils, bedding, supplies, and equipment. Storage areas for feed nutrients, soils, and bedding shall be separated from areas where the test systems are located …" "When appropriate, plant supply facilities shall be provided. As specified in the protocol, these include: (1) facilities for holding, culturing, and maintaining algae and aquatic plants, (2) facilities for plant growth, including, but not limited to greenhouses, growth chambers, light banks, and fields."

Basic thoughts:

1. For treating seedlings, treated area should be calculated by sprayer swath x length. Sprayer swath should be determined by the distance/height from the canopy and the nozzle type per manufacturer catalogue.
2. For greenhouse production trials, the treated area should be related to the commercial production guidelines, i.e., what was the recommended density per 1000 sqft GH space for the particular crop? Without this knowledge, it may be difficult to set up the proper plant spacing and make proper applications. When moving out the pots to a different area for treatment, the proper plant spacing should be maintained to mimic the commercial production.

Please discuss the situations and what would you suggest for the application. How to determine the plant spacing and row width? How to determine the treated area/cropping density? Please review and recommend the improvement in trial set-up, application, protocol and SOP language.

Example of protocol:

**10. TEST SYSTEM/CROP**:

Tomato - Use a commercial variety adapted for greenhouse growing conditions. Report: variety (indicate whether it is a small-fruited or large-fruited variety), source, lot number, date received, and other descriptive information if available. Small-fruited varieties (such as cherry or grape tomatoes) are generally less than 2 9/32 inches in diameter.

**10. TEST SYSTEM/CROP**:

Tomato - Use a commercial variety adapted for greenhouse growing conditions. Report: variety (indicate whether it is a small-fruited or large-fruited variety), source, lot number, date received, and other descriptive information if available. Small-fruited varieties (such as cherry or grape tomatoes) are generally less than 2 9/32 inches in diameter.

**15. APPLICATION TREATMENTS AND TIMING:**

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type | Spray Volume Range** |
|---|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| 02 | CYCLANILIPROLE | 0.054 lbs ai/acre | 487 ml/acre + adjuvant *** | Foliar directed | 20 to 100 GPA |

*The nominal formulation concentration of the test substance will be used in calculating application rates (see Section 13 for the nominal concentration).
**GPA=gallons per acre
***All applications shall include an adjuvant at a rate recommended by the adjuvant label unless the absence of an adjuvant has been chosen to differentiate two trials conducted by the same Field Research Director (see Part 11.4). Include a copy of the adjuvant label in the Field Data Book.

20.09- Crop maintenance pesticides and cultural practices, test plot history, and rooting medium composition. (The nature of this study is such that rooting medium composition does not need to be determined under GLP standards.)

20.13- Daily temperature/humidity records required from the date of planting or transplanting until last residue sample collection. If the protocol requires that transplants are treated with the test substance prior to transplanting, then weather records are required from the date of seeding. These records do not need to be determined under GLP standards.

Example of SOP 1

PROCEDURES:

1.0 Greenhouses should be large enough to contain an entire trial or portion of a trial with sufficient distance between the UTC and TRT plots to prevent contamination. To further prevent contamination when untreated and treated plots are in the same greenhouse, a plastic curtain can be installed up to the eaves of the greenhouse dividing the greenhouse in half.

2.0 If conducting more than one trial at a time in the greenhouse there should be adequate distance between the TRT plots to prevent contamination. When two treated plots are in close proximity to each other the plot not receiving an application can be tented with clear plastic that is a minimum of 2 mils in thickness. The plastic will be removed from the plants once the spray solution has dried on the plot receiving the application. Usually this is a period of approximately 30 minutes.

3.0 Temperature and humidity should be uniform at the trial sites within the greenhouse(s) to allow for uniform plant growth throughout the greenhouse. This is especially important if the greenhouse is divided in half with a barrier. When the greenhouse is divided in half with a barrier, electronic temperature and humidity monitoring devices will be placed in each half of the greenhouse to record daily temperature and humidity levels inside the greenhouse. These devices

will be contained inside an aspirated box. Monitoring device data will be downloaded approximately once a month when trials are being conducted in the greenhouse.

4.0 Greenhouse should be equipped to allow temperature, humidity, moisture and fertilization to be maintained that closely simulates commercial greenhouse production conditions.

5.0 The walls, floors and ceilings of the greenhouse should be maintained in good condition. The floors and aisles should be well drained and kept clear of any plant debris, weeds or unused equipment.

6.0 At the time of study applications, the shade curtain inside the greenhouse will be closed. All fans/coolers shut off and all vents closed. These items will remain in this condition until the spray application has dried on the plants that were sprayed. Usually this is a period of approximately 30 minutes. When making applications through an irrigation system or to the growing media, the shade curtain can be opened or closed, the fans/coolers can be on or off and the vents can be opened or closed.

7.0 Once an application has been applied to the treated plot, further activity within the greenhouse(s) shall proceed from the UTC plot to the TRT plot.

8.0 After each test substance application in the greenhouse, signs will be posted at entry points to the greenhouse and any shared plenums with the following information: pesticide, date applied, re-entry interval, contact name and contact phone number. Any personnel entering before the re-entry interval has elapsed must wear the appropriate personal protective equipment. Treated plots will be marked with Warning-Crop Destruct, Do Not Pick tape after the first application has been applied.

9.0 At the conclusion of each study the remaining treated crop plants will be cut off near the soil level in pots. The cut off plants, remaining treated crop, root systems, and growing media will be placed into the crop destruct area at XXXXX.

Example of SOP 2

Scope: All greenhouse studies conducted under Good Laboratory Practices (GLP's).

Procedures:

1. Each greenhouse should be large enough to contain an entire trial or portion of a trial with enough space between plots to prevent contamination. In some instances an impervious curtain (plastic or other) may be hung between treatments within a greenhouse during application to help prevent contamination.

2. If more than one trial is conducted in a greenhouse, there should be enough space between the trials to prevent contamination or interference between trials.

3. Environmental conditions (lighting, temperature, humidity and shade) should be sufficiently uniform at the trial sites within the greenhouse to allow nearly uniform plant growth throughout the trial area. This is especially important if the trial is conducted in more than one greenhouse.

4. Fertilization events will be recorded, providing date and amount of nutrients supplied.

5. Irrigation (one of the following methods will be used):

    a. Manual watering - Pots are watered daily by hand with a hose and nozzle to meet the needs of the developing plants. This amount changes as the season progresses and is dependent upon the experience of the individual doing the watering and light intensity into the greenhouse. The amount of water provided per plant is not measured or recorded. All irrigation events are applied as a drench to the soil at the base of the plant so that minimal foliage is contacted by the water.

    b. Drip irrigation watering – An emitter will be placed in each pot and the water flow rate will be periodically adjusted to meet the demands of the growing plants. The amount of water provided per plant is not measured or recorded. All drip irrigation is applied to the soil so that no foliage is contacted by the water.

6. The walls, floors, and ceilings of the greenhouse should be kept in good condition. Floors, benches and aisles should be well drained and reasonably free of debris and weeds.

7. Greenhouses should be equipped to allow temperature, lighting and moisture to be maintained in a way that simulates commercial greenhouse conditions or as required by the protocol.

8. Greenhouse temperature (and if possible humidity) will be monitored via datalogger to ensure that a proper growing environment has been maintained. Temperatures and relative humidity will be downloaded and printed at the completion of the trial and included in the field data notebook.

9. Cultural practices performed within the greenhouse will be recorded in the IR-4 field data notebook.

↑greenhouse↑ (2)

2.) how to determine row spacing

David - 5.25ft.

2 rows/plot.
Trellis plants

Blair - Question re: lettuce grows fast
keep plot size the same?
or change plot.

Cristina - Calculate commercial spacing.

David - would base spacing on when plant is large

Cristina - google Agricultural guides for area/state

width of row high + commercial is the same

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region dependent.
can/cannot adjust
plot size

Tristan
~~Justin~~ - not necessarily reflecting
grower practices if ~~they~~ when
they ~~stop~~ spraying earlier
start

Call S.D.

So ~~Tom~~ christina blocked
all the way to the top
 like a cavinset hut.

Blair - drench trt in gh.
Volume in protocol was not
really enough.

(2)

Blair - how of the tackles through.

read draft protocol + talk to S.D.

Leona - hydroponic

Blair - maybe per cubic volume of soil for drench.

- needs to be figured out - further guidance

drip injector - forget it bad

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Cristina -

SD should say a minimum gpa OR range for drench.

***Topic #2 Greenhouse Trials - Response summary***

Scenario – Consider:
1) For treating seedlings, treated area should be calculated by sprayer swath X length. Sprayer swath should be determined by the distance/height from the canopy and the nozzle type per manufacturer catalogue.
2) For greenhouse production trials, the treated area should be related to the commercial production guidelines, i.e., what was the recommended density per 1000 sq ft GH space for the particular crop? Without this knowledge, it may be difficult to set up the proper plant spacing and make proper applications. When moving out the pots to a different area for treatment, the proper plant spacing should be maintained to mimic the commercial production.

Please discuss the situations and what would you suggest for the application. How to determine the plant spacing and row width? How to determine the treated area/cropping density? Please review and recommend the improvement in trial set-up, application, protocol and SOP language.

- Consider crop dimensions, commercial growing practice (i.e. 2 rows/plot), production characteristics (i.e., trellis plants)
- Different growing characteristics to consider, i.e., lettuce – grows fast, keep plot the same or change plot?
- Calculate commercial spacing.
- Spacing based on when plant is large.
- Reference agricultural guide for area/state, consider width of row in GH and commercial the same.
- Region dependent if plot size can/cannot be adjusted
- Does not necessarily reflect grower practices if/when they start spraying earlier.
- Call Study Director – may have recommendations for layout, dimensions.
- Drench treatment in GH, consider if applied volume specified in protocol is enough, SD should day a minimum GPA or range for drench, maybe consider per cubic volume of soil for drench. Needs to be figured out for further guidance.
- READ DRAFT PROTOCOL AND TALK TO SD
- Hydroponic Examples?
- Drip Injector – Forget it, bad

# TABLE 3

# Seed Treatment

| NAME | SIGNATURE |
|---|---|
| ~~Anneka Anderson~~ | |
| Guy Kyser | |
| Josh Tilton | |
| Mika Tolson | |
| Greig Reicks | |
| Darrell Thomas | |
| Carolyn Jolly | |
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Scenario: See below a protocol involving a seed treatment (treatment 3). The protocol specifies that the actual seeding rate be determined based on the total amount of seed planted per plot area. Furthermore, the protocol states that "the application is considered acceptable if the accuracy is within -5% to +10% of the target seeding rate specified based on the commercial density for the field plot location (based on extension publication, or other reference material..)." The FRD provides the following calculation in Part 6E – Seeding Rate Calibration for Planting (See FDB Example #1) and Part 6J – Post Planting Rate Confirmation for Seed Treatment (See FDB Example #2). Please discuss whether the calculations were adequate to meet the study protocol requirements. For future improvements, what are the recommendations/suggestions for the protocol, Part 6E, 6J for seed treatments, SOP?

Protocol example:

Treatment 03 (Seed Treatment): Plant the treated seed received from the Seed Treatment Facility according to the normal commercial density (seeding rate/acre = number of seed/acre) of the trial location.
PLEASE NOTE: Do not exceed a planting rate of 139,212 seed/acre.
PLEASE NOTE: For this treatment (Treatment 03) direct seeding on bare ground must be conducted. Transplants and plastic-covered beds cannot be used for Treatment 03.

After the seed from the various trials is treated, application rate verified and seed returned to each respective field site, the Field Research Directors are to use this seed to plant their Treatment 03 plots.

SEED PLANTER CALIBRATIONS must be performed to ensure accurate delivery. (Check planter to be sure parts are working properly. Check seed tubes to make sure they are clear and allow seed to drop through.) Fully document the procedure used to calibrate the planter in the Field Data Book.

Be sure to use control seed to conduct the calibration of the planter. The control seed used in the calibration should not be reused for planting in the trials.

A calibration consists of a minimum of three consecutive, documented checks. The variation of the total output recorded for any one of the three checks must not be greater than 5% from the mean for the full calibration.

Complete calibration data from another trial (performed on the day of or day prior to the application in this trial) may be used. However, a recheck (single output check and speed or area recheck) must be performed just prior to planting in this trial.

If seed is planted by hand, CALIBRATION is not necessary. Actual Seeding Rate (number of seed/A) should be determined based on total amount of seed planted per plot area.

ACTUAL SEEDING RATE (number of seed/A): Determine actual seeding rate and fully document the procedure used in the Field Data Book. The application is considered acceptable if the accuracy is within -5% and +10% of the target seeding rate specified based on the commercial density for the field plot location (based on an extension publication, or other reference material and documented in the Field Data Book). If the actual seeding rate did not meet this range, the Study Director must be notified of this deviation before proceeding with this trial.

# FDB Example #1

FIELD ID NO: _____

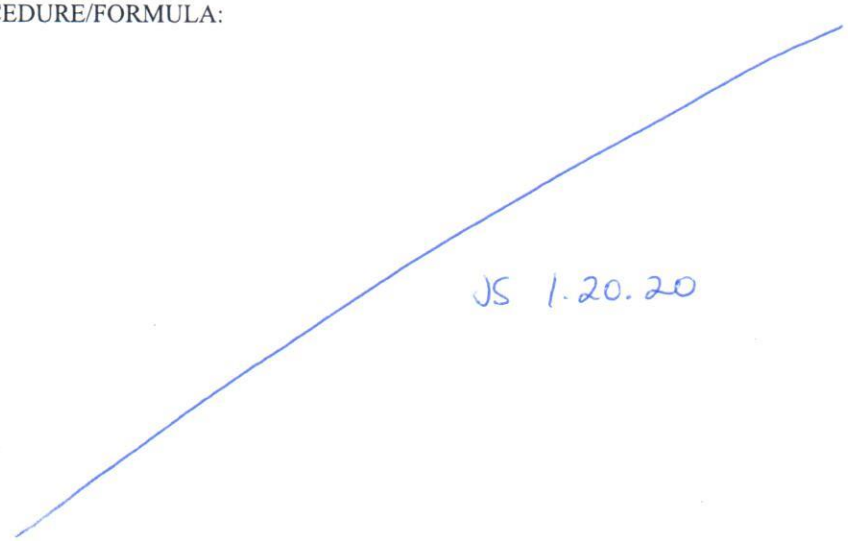
IR-4 FIELD DATA BOOK

PART 6. PLANTING RECORDS-SEED TREATMENT TRIALS

E. SEEDING RATE CALIBRATION FOR PLANTING

*INSTRUCTIONS: Complete a separate form for each planting, unless the same parameters are used; such as you are using the same equipment, and have performed a recheck to confirm the result of the full calibration. Determine the seeding rate delivery from the planting equipment. Briefly describe the procedure, including formulas used to determine seeding rate calibration. Show all calculations and units. Equations used in electronic (computer software) calculations in this trial must be transcribed or printed out and attached here. Computer-generated values (as opposed to those entered by the field cooperators) must be reviewed and clearly delineated by circling, initialing, and dating.*

PROCEDURE/FORMULA:



JS 1.20.20

CALCULATIONS:

Each seeded section of plot bed marked at 2' intervals. Seeds placed at each interval.

40' row ÷ 2' plant spacing = 20 seeds/row x 2 rows = 40 seeds/plot

*ABOVE DATA ENTERED BY:* JS *DATE:* 1.20.20



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PDB Example #2

FIELD ID NO: _____

# IR-4 FIELD DATA BOOK

## PART 6. PLANTING RECORDS-SEED TREATMENT TRIALS

J. POST PLANTING RATE CONFIRMATION FOR **SEED TREATMENT**

PLANTING DATE 1-20-20

EXAMPLE FORMULAS: The formula below may be used to calculate the amount of TREATED SEED planted per hectare. Other formulas may be used instead; however, it is not sufficient to merely compare the actual seeding rate to the "practice" seeding rate.

1) $\frac{\text{X g seed planted in plot} \times \text{1 plot}}{\text{Plot dimensions (width (m) x length (m))}} \times \frac{10{,}000\ m^2}{\text{hectare}}$ OR

= grams seed applied per hectare

2) $\frac{\text{X g seed planted in plot} \times \text{1 plot}}{\text{Plot dimensions (width (ft) x length (ft))}} \times \frac{43{,}560\ ft^2}{\text{acre}} \times \frac{\text{lb}}{453.6\ g}$

= lbs seed applied per acre

**********

Each plot seeded at a rate of approximately 4400/Acre

43560 $Ft^2$/acre ÷ 5' bed spacing ÷ 2' seed spacing =

4,356/A

WAS ACTUAL SEEDING RATE WITHIN -10% TO +10% OF PROTOCOL RATE?

*(Check one)* YES____ NO____ NA IF NO, **Contact the Study Director immediately.**

JS 1.20.20

*ABOVE DATA ENTERED BY:* JS *DATE:* 1.20.20

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SOP Example #1:

**Title:** Method for seeding or transplanting.

**Purpose:** Help ensure that an appropriate and high quality crop is produced in trials conducted under good laboratory practices (GLPs).

**Scope:** All locations developing data on test crops.

**Procedures:**

1. Determine the correct species and variety to use as specified by the study protocol. If the variety is not specified, select a variety commonly used in the area by commercial producers. With transplanted crops, plants as uniform in growth and color as possible will be used.

2. Determine within and between row spacing and seed/transplant depth as specified in cooperative extension services recommendations.

3. If exact seeding rate cannot be attained due to seed size and/or equipment capabilities, thinning of the emerged crop to the proper population will be performed.

SOP Example #2:

Procedures:

Registrant treated seed:

1. If seed is to be treated by the registrant, seed of a suitable variety for the region to be grown will be procured and sent to the seed treating facility. Alternatively, the registrant or IR-4 may determine which seed is to be treated for the study.

2. Upon receipt of the treated seed, it will be stored in a monitored environment until planting. If this storage is the test substance storage, the seed will be bagged in plastic to prevent pesticide contamination. After planting unused seed may be disposed of in an acceptable manner and the containers for the treated seed will be retained until the final report has been signed by the study director.

Field Research Director treated seed:

Liquid Pesticide Seed Treatments

1. Measure out the correct amount of pesticide required for the amount of seed to be treated.

2. If pesticide requires dilution, dilute as directed by protocol or the pesticide label.

3. Apply the pesticide in a protocol acceptable manner to achieve thorough coverage of the seed, while minimizing excessive liquid application. If seed type allows, seed may be tumbled during application to facilitate thorough coverage. If seed type does not allow tumbling (i.e. potato, etc.), seed will be treated on one side, rolled over and treated on the other.

4. If seed is not to be immediately planted after treating, treated seed should be transferred to a clean container, labeled and stored appropriately until planting.

Dry Pesticide Seed Treatments

1. Measure out the correct amount of pesticide required for the amount of seed to be treated.

2. Place seed in a container of a material that will minimize pesticide adhesion to the container. Add the dry pesticide, close the container and agitate seed until the pesticide thoroughly coats the seed. Transfer the treated seed into the planter, along with any remaining dry pesticide left in the container or plant by hand.

Seed Treatment 2/26/20

Were protocol requirements met?

- Need commercial seeding rate to compare
- Was seeding done by hand? Method (finger poke? etc)
- What's the crop? What's the seed
  How was this variety selected
- No calibration data or indication how planted
- Need description of planting procedure
- Plot layouts are missing
  ~~No row or bed width~~
- Include coop extension info in notebook
- Depth of planting not included
- Didn't actually calculate seeding rate

SOPs

- SOP 1 doesn't say to plant seed according to
  1) cooperative extension info
  2) Procedure 3 - add contact Study Director to make sure this is ok

SOP 2

- IR-4 wouldn't ask PRD to treat seed - done offsite

~~Proto~~

2/26/20

Protocol

· TRT 03 Direct seeding on bare ground

What does this mean?

How deep? What kind of bare ground

Sounds like seeds should be ~~done~~ planted on top of dirt

Notebook Pages

· Much more info is needed ~~on~~ to be recorded than what's just on the notebook page

Calibrations

· Problems — treated seed can come out a diff rate if you calibrate w/ untreated seed

- Seed coating can cause gumming/sticking to the planter, depends on humidity

***Topic #3 Seed Treatment*** - Response summary

Scenario – See protocol involving a seed treatment. The protocol specifies that the actual seeding rate be determined based on the total amount of seed planted per plot area. Furthermore, the protocol states that "the application is considered acceptable if the accuracy is within -5% to +10% of the target seeding rate specified based on the commercial density for the field plot location (based on extension publication, or other reference material…)." The FRD provides the following calculations. Please discuss whether the calculations were adequate to meet the study protocol requirements. For future improvements what are the recommendations/suggestions for the protocol, FDB, SOP?

**Were protocol requirements met?**

- Need commercial seeding rate to compare
- Was seeding done by hand? Method (finger poke, etc.)?
- What's the crop? What's the seed? How was this variety selected?
- No calibration data or indication how planted.
- Need description of planting procedure.
- Plot layouts are missing
- Include crop extension info in notebook
- Depth of planting not included
- Didn't actually calculate seeding rate
- More info is needed than what's just on the notebook pages

**SOPs**

- SOP 1 doesn't say to plant seed according to cooperative extension info; procedure 3 – add Contact Study Director to make sure this is ok.
- SOP 2 – IR-4 wouldn't ask FRD to treat seed, this is done offsite.

**Protocol**

- Treatment 3 – Direct seeding on bare ground, what does this mean? How deep? What kind of bareground? Sounds like seed should be planted on top of dirt.

*Calibration problems – treated seed can come out a different rate if you calibrate with untreated seeds, seed coating can cause gumming/sticking to the planter, depends on humidity.

# TABLE 4

# Post-Harvest

| NAME | SIGNATURE |
|---|---|
| Keri Skiles | |
| Darren Turner | |
| Fabiola Zuno | |
| Rebecca Tannenbaum | |
| Anthony VanWoerkom | |
| Alfredo Rodriquez | |
| Eileen Nelson | |
| | |
| Dan Runkel | |
| | |
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Post-harvest treatment

Scenarios: Two types of post-harvest treatments are common: dipping and in-line/conveyor line spraying. Following are two protocol examples for applications. Please picture yourself that you are doing the trials. You want to treat 25 lb of commodity per treatment following the SOPs (see examples, few FRDs have such SOPs). Please calculate the amount of TS and volume of carrier for the treatments and determine the application procedure. Please discuss what you got for the applications. What are important factors to consider for each trial when setting up the experiment? Pay attention to the amount of water and TS needed when you make the application. If making application based on pass times, do you use the nozzle swath (i.e., 18") or the commodity layout (i.e., 12") to calculate the treated area. Please discuss and review the protocols/SOPs and recommend, if any, improvements for future.

Protocol Example 1:

**15. APPLICATION TREATMENTS AND TIMING:**

**Prior to treatment, remove excess soil and plant debris from sweet potatoes using standard commercial practices.**

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type | Spray Volume Range |
|---|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| 02 | TEBUCONAZOLE | 0.00083 lb ai/100 lbs of roots | 0.87 ml/100 lbs of roots | Post Harvest Conveyor Line Spray** | Sufficient water for complete coverage |

*The nominal concentration of the formulated test substance will be used in calculating application rates (see Section 13 for the nominal concentration).
**To ensure proper coverage, roots should be tumbling as they are treated.

**All trials: Make 1 application as a post harvest spray as described above and below.**

Treatment 02 Conveyor Line Spray:
Ensure proper coverage of roots by mixing the fungicide solution in an appropriate amount of water for complete coverage of roots (0.87 mL Orius 3.6F / 100 lb of roots). Roots should be tumbling as they are treated. Use T-Jet, CDA or similar application system and apply as a post harvest conveyor line spray. **Allow roots to dry prior to sampling.**

The conveyor line spray can be mimicked by laying out a known weight of sweet potatoes, in close proximity to each other, on a porous surface (wire mesh). Prepare one spray mix in sufficient water to cover all the roots (based on the weight of the sweet potatoes being treated) at the rate of 0.87mL/100 lbs of roots. Spray approximately one-half of the mixture on the sweet potatoes in a uniform manner. Immediately turn the roots over and spray the remaining half of the spray mixture (DO NOT ALLOW the spray to dry between treating each side). **Allow roots to dry prior to sampling.**

Protocol Example 2:

**15. APPLICATION TREATMENTS AND TIMING: All trials**

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type | Spray Volume Range |
|---|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| 02 | Azoxystrobin + Fludioxonil | 0.9017 lb azoxystrobin/250,000 lb of fruit + 0.9017 lbs fludioxonil/250,000 lb of fruit | 1715 mls (58 floz)/250,000 lb of fruit | In-line aqueous or fruit-coating spray | 20-25 gallons / 250, 000lb of fruit |
| 03 | Azoxystrobin + Fludioxonil | 0.9017 lb azoxystrobin/100 gal + 0.9017 lb fludioxonil/100 gal | 1715 mls (58 floz)/100 gal | In-Line Dip/Drench | Not applicable |

*The nominal formulation concentration of the test substance will be used in calculating application rates (see Section 13 for the nominal concentration).

**All applications are to be made to ripened fruit. The fruit must be ripe in order to cut in half and remove stone and to divide half of the collected samples into pulp and peel. (See Sampling Table in Section 18.)**

*Harvest avocados →allow to ripen→ apply test substance→ then sample immediately after test substance has dried.*

Treatment 02 In-line Aqueous or Fruit-Coating Spray

Make one application as an in-line aqueous or fruit-coating spray application. Ensure proper coverage of the fruit by mixing the fungicide solution in an appropriate aqueous dilution of wax/oil emulsion for fruit being treated. Use T-jet, CDA or similar application system. **Allow fruit to dry prior to sampling.**

The in-line aqueous or fruit-coating spray can be mimicked by laying out a known weight of avocados, in close proximity to each other, on a porous surface (wire mesh). Prepare one spray mix in sufficient emulsion to cover all the fruit (based on the weight of the avocados being treated) at the rate of **58 fl oz/250,000 lb of fruit**. Spray approximately one-half of the mixture on the avocados in a uniform manner. Immediately turn the fruit over and spray the remaining half of the spray mixture (DO NOT ALLOW the spray to dry between treating each side). **Allow fruit to dry prior to sampling.**

Treatment 03 In-line Dip/ Drench

Make one application as an in-line dip/drench. Ensure proper coverage of the fruit by applying at a rate of 58 fl oz of product in 100 gallons of an aqueous dilution of wax/oil emulsion. Dip the fruit for 30 seconds and allow the fruit to drain on a porous surface. **Allow fruit to dry prior to sampling.**

SOP Example 1:

PROCEDURE:

1.0 Operation

1.1 The post-harvest treater at XXX is a nonGLP piece of equipment.

1.2 Prior to calibration, a general inspection will be made of the treater for visual damage or potential problems. The treater system will then be operated to verify that the application equipment provides the desired spray pattern and that the system is operating properly.

1.3 The spray system which consists of an input table, wash/rinse brush bed, sponge bed, treatment brush bed, cross-over conveyer belt (which serves as the input table if the brush beds are not used or the output table if the PVC rollers are not used), PVC rollers, output table, and specific application equipment. Specific application equipment consists of a Tjet nozzle, CDA applicator, wig-wag applicator, and drench systems. The treater or portions of the treater may be uniquely adapted to an assortment of application requirements.

1.4 Before operating the treater, the specific equipment to be used should be adjusted to approximately the desired settings to enable calibration.

1.5 Treater output volume and speed setting information shall be recorded at the time of calibration. Actual settings and pass time during application will be recorded to verify the actual application rate and should remain unchanged from calibration.

1.6 After use, the treater equipment should be cleaned.

2.0 Calibration

2.1 Calibration of the treater will occur 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 Typically, calibration requires recording the weight of each container of fruit to be treated. Prior to recording, each container weight will be adjusted by sorting fruit between container so that each container weight will not vary by more than 2% of the average weight of each container to be treated for the same sample set.

2.1.2 Constant pressure or pump settings will be set when it affects the application system.

2.1.3 Discharge volume of liquid from each nozzle or the CDA applicator 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 or CDA applicator which varies greater than 5% should be cleaned or replaced. The averaged measurement will be used in the final calculations made to determine the actual application volume.

2.1.4 The sprayer speed shall be timed over a known distance, and each individual measurement shall not vary more than 5% from the average of 3 or more consecutive measurements. The averaged measurement will be used in the final calculations made to determine the actual application volume.

2.2 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 Prior to use, after use and between treatments with different chemicals, the spray system will be thoroughly cleaned with soap and water. After the system has been operated and thoroughly flushed with soap and water, it will be thoroughly rinsed with clean water.

3.2 Prior to use, after use and between treatments with different chemicals, the treater surfaces that may impact the samples will be cleaned with soap and water and thoroughly rinsed with clean water. A high pressure hot water spray system and/or high alkali solution should be used to help remove chemical residues when waxes are used.

3.3 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:

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

4.0 Maintenance

4.1 As a non-GLP piece of equipment, maintenance records are also non-GLP. Copies of these records will be requested each year the treater is used.

5.0 Contingency Procedures

5.1 If during the generation, measurement or assessment of data, an equipment malfunction occurs, the supervising personnel and Study Director 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 non-GLP equipment log describing the repair.

6.0 Responsible Personnel

6.1 During the application process, equipment inspection, calibration, and cleaning shall be performed or supervised by the Field Research Director.

7.0 Records

7.1 Equipment records are non-GLP and are maintained by UCKARE. A record of trialspecific activities will be maintained in the appropriate field data book.

SOP Example 2.

**Title:** Procedures for dip, drench and low volume application of test substance.

**Purpose:** To assure that the trial(s) pesticide(s) are applied uniformly to the commodity.

**Scope:** Sites conducting trial(s) to obtain registration of pesticides under GLP guidelines.

**Procedures:**

1. Select commodity as specified in protocol. For post-harvest applications, if possible, use freshly harvested fruits or vegetables. Document source and history (if available).

2. Wash fruit/vegetables, if needed, as specified in protocol to remove dirt and debris. If procedure is not specified in protocol, wash commodity using the following procedure or document procedure used.

   a. Dip commodity in dilute soap solution (i.e. 0.5% v/v Dawn™ dish soap in water) for a recorded timed interval (i.e. 30 seconds) with agitation.

   b. Thoroughly rinse with water to remove soap solution.

   c. Dry fruit/vegetables prior to initiating treatments.

   d. If chlorination is specified in protocol, fruit/vegetables should be in the chlorinated wash from one to ten minutes. Concentrations of wash generally range from 50 to 150 ppm (0.8 - 2.4 pints of 5.25% NaOCl per 100 gallons.

3. Check application equipment. Ensure that equipment is clean, working properly. If applicable, ensure all settings of pressure, speed, nozzle/outlet position etc. are set according to specification from the calibration as previously performed.

4. **Dip applications:** Apply as specified in protocol. If procedure is not specified in protocol, use the following method or document method used.

   a. Mix solution of test substance as stated in the protocol. Treatment should be applied within 2 hours of mixing.

   b. Dip the commodity into the test solution. Record the time (i.e. dip for 30 seconds). A basket, net, or other container can be used to submerge/float the commodity into the larger container of test substance solution. If necessary gently agitate or submerge floating fruits or vegetable to ensure even exposure to the test substance solution.

   c. Drain commodity over the test substance solution container. All treatments should have the same drain and drying times unless otherwise specified in protocol.

   d. Roll dry to ensure even drying on the commodity. If a roller unit is not available, this can be accomplished by manually rolling the fruit at timed intervals (i.e. every 30 seconds for the first 3 minutes, then every 2 minutes for the following 10 minutes.). Document procedure used.

5. **Drench applications:** Apply as specified in protocol. If procedure is not specified in protocol, use the following method or document method used.

   a. Mix solution of test substance as stated in the protocol. Treatment should be applied within 2 hours of mixing.

b. Apply/pour test substance solution over commodity as specified in the protocol. If a timed interval is required, record the time for drenching. If a specified volume per area or per number/weight of fruit/vegetables is stated in protocol, record the volume of test substance solution applied.

c. For post-harvest applications, roll dry commodity. (Drench applications to soil/media should not require a drying procedure.)

6. Controlled Droplet Applicators (CDA) or In-Line applications. Apply as specified in protocol. If procedure is not specified use the following method or document method used.

   a. Mix solution of test substance as stated in the protocol. Treatment should be applied with 2 hours of mixing.

   b. Prime application unit long enough to ensure that the test substance mixture will be properly applied (i.e. coat brushes in the system prior to introduction of commodity).

   c. Fruits/vegetables should have adequate application time such that commodity is uniformly coated with test substance solution after application.

   d. Roll dry to ensure even drying of commodity. If heat is required prior to/during drying document equipment and procedure used.

7. After applications, clean equipment and if appropriate, the area where the treatment was applied. Document in appropriate logs.

8. Treated areas should be posted with warning signs which indicate that a pesticide has been applied. Re-entry will follow label directions or if none exists, re-entry interval will be 24 hours.

# Table 4

Trt 2

$\frac{1715}{250{,}000 \text{ lbs}} = \frac{1 \text{ ml}}{100 \text{ lbs}} =$

$\frac{171{,}500}{250{,}000 \text{ lbs}} =$ 0.68 mls of TS per 100 lbs of fruit

$\frac{20 \text{ gal}}{250{,}000 \text{ lbs}} = \frac{X \text{ gal}}{100 \text{ lbs}}$

$\frac{2000}{250{,}000} = 0.008 \text{ gal}$

$0.008 \text{ gal} \times 3785 \text{ ml} =$

30.28 ml Water

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Trt 3

$\frac{1715}{1000 \text{ gal}} = \frac{X \text{ ml}}{10 \text{ gal}}$

$\frac{1715}{1000} = 171.50 \text{ ml}$ in 10 gal for 30 sec.

Important things to consider when setting up experiment

- Commodity layout
- pass times
- Flow rate
- Nozzle type

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***Topic #4 Post-harvest Treatment*** - Response summary

Scenario – Two types of post-harvest treatments are common: dipping and in-line/conveyor line spraying. Following are two protocol examples for applications. Please picture yourself that you are doing the trials. You want to treat 25 lb of commodity per treatment following the SOPs (see examples, few FRDs have such SOPs). Please calculate the amount of TS and volume of carrier for the treatments and determine the application procedure. Please discuss what you got for the applications. What are important factors to consider for each trial when setting up the experiment? Pay attention to the amount of water and TS needed when you make the application. If making application based on pass times, do you use the nozzle swath (i.e., 18") or the commodity layout (i.e., 12") to calculate the treated area. Please discuss and review the protocols/SOPs and recommend, if any, improvements for future.

Important things to consider when setting up experiment:

- Commodity layout
- Pass times
- Flow rate
- Nozzle type

# TABLE 5

# Non-Typical Applications

| NAME | SIGNATURE |
|---|---|
| Michelle Mitchell | |
| Michael Long | |
| Julia Coughlin | |
| Jay Hyland | |
| Cary Hamilton | |
| Stephan Flanagan | |
| Dan Heider | |
| Robert Welker | |
| Bill Barney | |
| Carlos Gomez | Carlos Gomez |
| Christine Gagnon | Christine Gagnon |
| Andy Doklowic | Andy Doklowic |
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Topic 5/Table 5 Non-Typical Applications

How do you plan for a non-typical trial? Several examples are provided but there are many others you may want to talk about. Below is a list of some things to consider.

Consider:

- For an application type that is unusual or one that you have never performed before what, do you look for in a protocol so you understand what is required?

  Much of it comes down to read and re-read section 15. Do you understand what is being requested and if not, consulting with the study director or other FRD's well in advance of the trial to obtain any needed guidance. Sometimes verifying the formulation of the T.S. in section 13 can be helpful to ensure that your understanding of the application is compatible with the T.S.

- What are some resources to use when determining how an application is done commercially and how you can simulate it?

  There was consensus that consulting actual growers of the crop, whether within your state or from around the country is necessary to understand a crop that you are unfamiliar with. Finally, it was acknowledged that the internet can be a powerful tool in gaining an understanding of an unfamiliar crop as well.

- How do you calibrate non- typical equipment then calculate and measure for test substance application?

  Remember the basics - output and speed. You may be walking sideways or maneuvering a sprayer differently but it all comes down to what is your output and at what speed are you moving.

- If you need to borrow, modify or build equipment how do you document it for GLP compliance?

  Discussion centered on the fact that if you don't have an SOP b/c of an unforeseen circumstance, that you simply and accurately should document everything you do with piece of equipment in the FDB. If you do have enough lead time prior to the application there is the option of creating an SOP and submitting it for approval.

- Do you need an SOP for a Non-typical application?

  Several of us who do not currently have an SOP for seldom used or borrowed equipment, decided that it would be good to do so in the future. Most of our discussion centered around the difference between a once and done application or does it recur every few years. For once and done it was felt that an expanded documentation in the FDB would suffice, but if a non-typical application starts to show up every few years, then an SOP should be developed.

***Note that these trials require the collection of fresh samples from the greenhouse and fresh and dried samples from the field. Greenhouse samples are taken after the greenhouse applications are made prior to planting in the field. Remaining greenhouse plants will be transplanted to the field and the subsequent collection of both fresh and dried samples from the field plots after the field applications. Please plan your trials based on the required samples***.

15. APPLICATION TREATMENTS AND TIMING:

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type | Spray Volume Range** |
|---|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| 02 | MEFENOXAM | 0.85 lbs ai / acre [Subdue MAXX®] | 1609 ml/acre | Greenhouse Application: Soil Surface Spray | 20-40 GPA |
| | | 0.85 lbs ai / acre [Subdue MAXX®] | Mix 1.0 fl oz (29.6 ml) in 100 gallons of water and apply 1 pint of solution per sq ft of soil surface | Greenhouse Application: Soil Drench | One pint per square foot |
| | | 1 lb ai / acre [RidomilGold SL] | 946 ml/acre | Field Application: Pre-plant Incorporated, broadcast or banded | 30-80 GPA |
| | | 1 lb ai / acre [RidomilGold SL] | 946 ml/acre | Field Application: Basally Directed | 30-80 GPA |

Greenhouse Application (1st application): Make the first application in the greenhouse as a soil surface spray to production trays after seeding and before seedling emergence in sufficient water to provide uniform coverage. Irrigate lightly with at least ½ inch of water within 24 hours after application to move the product into the growing media profile, but not to the point of leaching. Note that the ½ inch of irrigation can be spread over the 24 hour period and does not need to be applied in one application.

***Document the amount of irrigation applied after the application***

Greenhouse Application (2nd application): Make the second application in the greenhouse as a soil drench 28 ±2 days after the first application to production trays.

Note that sampling (fresh greenhouse samples only) will occur 21 (±2) days after the final greenhouse application (see Sections 17 and 18). The remaining transplants will be transferred to the field for additional applications.

***Please also note that hardening of transplants in production trays may be conducted for up to one week prior to transplanting basil into the field plots.***

Pre-Plant Incorporated Field Application (3rd application): The third application will occur in the field as a broadcast or banded pre-plant incorporated treatment in sufficient water to provide uniform coverage. Mechanically incorporate into the top 2 inches of soil.

***Document the depth and method of incorporation***

Then transplant the remaining basil plants from the greenhouse into the field plots after the pre-plant incorporation.

Basally Directed Field Application (4th application): The fourth application will occur in the field as a basally directed spray at 28 (±2) days after field transplanting. Direct the spray toward the base of the plants and cover approximately 6-8 inches on each side of the plants. Collection of field samples (fresh and dried) will occur 21 (±2) days after the fourth application.

*Note that the treated area for directed applications is calculated as row spacing X number of rows X plot length.*

15. APPLICATION TREATMENTS AND TIMING: (For all trials, except 10620.11-CA86 and 10620.11-CA87):

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type | Spray Volume Range** |
|---|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| 02 | DPX-QGU42 OD (100 g ai/L) | 0.5 oz a.i./A = 0.03125 lb a.i./A or 14.175 grams a.i./A (35 grams ai/hectare) | 142 ml/acre +NIS or COC *** (350 ml/hectare) | Foliar Spray | 20 to 50 GPA (187 to 468 L/Ha) |
| 03 | DPX-QGU42 SC (200 g ai/L) | 4 oz a.i./A or 0.25 lb a.i./A or 113.4 g a.i./acre (280 grams ai/hectare) | 570 ml/acre (1400 ml/hectare) | Soil drench or through drip irrigation | 200 ml*** fungicide solution per plant or as appropriate through the drip irrigation system. |

**Trt #02:**
Make 4 foliar applications at 3 (±1) day intervals with the last application on the day of harvest.

**Trt #03:**
Make 2 soil-drench or drip irrigation applications. The applications may be made through drip irrigation, as a soil-directed spray or by pouring (watering can or similar) the required amount of fungicide solution around the base of the plant. Applications made as soil-directed sprays or by pouring will require the subsequent application of ¼ - ½ inch of water as overhead sprinkler irrigation or garden hose drench on the row.

The first application should be at 7(+1) days before harvest. The second application should be made on the day of harvest. A minimum of 4 hours should pass from the end of application until the fruit are collected for the 0-day PHI samples.

If drip irrigation is used to make the application in Trt#03 then: Apply in 0.5 acre inches of water (±10%). Apply irrigation water and test substance as follows: first 1/4-1/3 of irrigation water with test substance, final 2/3-3/4 of irrigation water without test substance. The fractions are not exact requirements but rather guidance as to how to apply.

If a soil-directed spray is used, it can be applied in two ways. It can be applied around individual plants by using a single nozzle boom and circling the plant with the nozzle aimed under the leaves toward the soil. The soil-directed spray may also be applied as a band along each side of the row that is directed to apply the fungicide solution to the soil near and under the lower leaves. This type of application requires the subsequent application of ¼ to ½ inch of water (±10%) as overhead sprinkler irrigation or garden hose drench on the row.

If a drench is used to make the application in Trt#03 then, apply the appropriate amount of test substance per plant in approximately 200 ml of water per plant. **Avoid spraying any fruit.** Utilize typical plant spacing to determine the number of plants per acre and the proportion of the per acre rate that should be applied to an individual plant. Example: If there are 15,000 lettuce plants per acre and we have 100 plants in our plot then we need to apply (100/15,000) X 570 ml product per acre = 3.80 ml product /100 plants. At 200 ml/plant, we should mix 3.80 ml of test substance in (100 plants X 200 ml/plant =) 20 liters and apply 200 ml of this solution per plant as a drench or soil directed spray within a 12-18 inch diameter circle around the base of the plant. The amount per plant can also be calculated using plot size and plant spacing. This type of application requires the subsequent application of ¼ to ½ inch of water (±10%) as overhead sprinkler irrigation or garden hose drench on the row.

## 14. TEST SUBSTANCE APPLICATION:

Soil broadcast - dry material

**14.1 Option 1:** Apply the test substance by shaking a container with one or more apertures to distribute the M-Ps (mini-pellets) evenly over the treated plot. The ground on which the test substance is applied must be wet (damp or saturated) via rainfall, irrigation, or manually watering the area to be treated. Measure the correct amount of test substance for a measured area of the plot into the container and apply. Continue measuring and applying more test substance to additional segments of the plot until the entire plot is treated as per the other requirements of Sections 14 and 15. **The application is considered acceptable if the accuracy is within -5% and +10% of the target rate specified in Part 15.** If the application did not meet this range, the Study Director must be notified of this deviation before proceeding with this trial.

**14.2 Option 2: Simulate commercial application practices** by applying the test substance in a manner that represents a major application technique that is used by area commercial growers, such as a fertilizer applicator, while following the directions specified in Section 15. The ground on which the test substance is applied must be wet (damp or saturated) via rainfall, irrigation, or manually watering the area to be treated.

**14.3 (Option 2 continued) Full Calibrations** for output and speed must be performed to ensure accurate delivery. A calibration consists of a minimum of three consecutive, documented checks for hopper output and speed (equipment or walking speed). The variation of the total output recorded for any one of the three checks must not be greater than 5% from the mean for the full calibration. **If a hand-held spreader is used, calibration of the output may be omitted if the entire amount of test substance that is placed in the spreader is applied to the plot.**

**Discharge/Output Calibrations must be performed:**

Just prior to the first application of test substance[2], completely calibrate.
Another complete calibration must be performed and documented when application parameters or equipment components have changed between applications. Recalibration is required after any of the following have changed: application type; intended hopper output; application equipment, etc. The recalibration is required even if the equipment has been changed back to the parameters of the initial calibration. It is not necessary to recalibrate when equipment is transported offsite or cleaned; however a recheck must take place prior to the next application. Use equipment logs to document changes in the equipment parameters.
**The test substance M-Ps that are used in the calibration should not be re-used for applications in the trials.**

**Rechecking the output**, at a minimum, is necessary for multiple applications, as long as parameters have not changed. A single output check may be conducted to confirm consistent delivery (±5% of the last complete calibration) just prior to subsequent applications.

**The equipment must be completely re-calibrated if:**

- the recheck results in an output that differs from the mean of the complete calibration by greater than 5%

**Calculations for the amount of test substance to be applied will always be based upon mean output calculated from the most recent complete calibration data, not on the recheck results. Verification of the amount of test substance that has been applied will always be calculated using the most recent complete calibration data.**

Speed Calibrations must also be performed prior to the first test substance application. Conduct speed calibration in an area adjacent to the test plot, or on similar terrain.

Complete calibration data from another trial (performed on the day of or day prior to the application in this trial) may be used. However, a recheck (single output check) must be performed just prior to the application in this trial, but subsequent to any other applications with the application equipment.

**14.4 (Option 2 continued) Actual Application Rate:** Record actual application pass-times in the Field Data Book and verify the accuracy of the application against the protocol results. **The application is considered acceptable if the accuracy is within -5% and +10% of the target rate specified in Section 15. If the application did not meet this range, the Study Director must be notified of this deviation before proceeding with this trial.**

## 15. APPLICATION TREATMENTS AND TIMING:

| Trt# | Treatment | Target Rate of active ingredient | Target Rate of formulated product* | Application Type |
|---|---|---|---|---|
| 01 | Untreated | Not Applicable | Not Applicable | Not Applicable |
| 02 | METALDEHYDE | 1.0 lbs ai/acre | 11,340 grams/acre | Soil broadcast |

*The nominal formulation concentration of the test substance will be used in calculating application rates (see Section 13 for the nominal concentration).

**Make 3 applications at 7(±1) day intervals with the first application within one week after seedling emergence. The last application should occur prior to bloom. Foliage samples will be collected one day after the last application.**

***Topic #5 Non-Typical Applications*** - Response Summary

Scenario – How do you plan for a non-typical trial? Several examples are provided but there are many other you may want to talk about. Below is a list of things to consider.

1) **For an application type that is unusual or one that you have never performed before, what do you look for in a protocol so you understand what is required?** Much of it comes down to read and re-read section 15. Do you understand what is being requested and if not, consult with the study director or other FRD's well in advance of the trial to obtain any needed guidance. Sometimes verifying the formulation of the T.S. in section 13 can be helpful to ensure that your understanding of the application is compatible with the T.S.
2) **What are some resources to use when determining how an application is done commercially and how you can simulate it?** There was consensus that consulting actual growers of the crop, whether within your state or from around the country is necessary to understand a crop that you are unfamiliar with. Finally, it was acknowledged that the internet can be a powerful tool in gaining an understanding of an unfamiliar crop as well.
3) **How do you calibrate non-typical equipment then calculate and measure for test substance application?** Remember the basics - output and speed. You may be walking sideways or maneuvering a sprayer differently but it all comes down to what is your output and at what speed are you moving.
4) **If you need to borrow, modify or build equipment, how do you document it for GLP compliance?** Discussion centered on the fact that if you don't have an SOP because of an unforeseen circumstance, that you simply and accurately should document everything you do with piece of equipment in the FDB. If you do have enough lead time prior to the application there is the option of creating an SOP and submitting it for approval.
5) **Do you need an SOP for a non-typical application?** Several of us who do not currently have an SOP for seldom used or borrowed equipment, decided that it would be good to do so in the future. Most of our discussion centered around the difference between a once and done application or does it recur every few years. For once and done it was felt that an expanded documentation in the FDB would suffice, but if a non-typical application starts to show up every few years, then an SOP should be developed.

# TABLE 6

# Phytotoxicity Documentation

| NAME | SIGNATURE |
|---|---|
| Megan Boatwright | |
| Michael Horak | |
| Benjamin Fraelich | |
| Alexis Thompson | |
| Bernard Zandstra | |
| Wilfredo Robles | |
| Brian Maupin | |
| Gomez Carlos | |
| Janine Spies | |
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Scenarios: Some protocol requested specifically for phytotoxicity ratings. FRDs generally have their SOPs for observing and reporting phytos. Form Part 6 K – Post Treatment Record has prompts/space for recording phytos. Below are two examples of protocol requirements and two SOPs. In both cases, FRD recorded 'NO' in Form Part 6K. Please discuss whether it was adequate to meet the protocol/SOP requirements. For future improvements, what are the recommendations/suggestions for the protocol, SOP, and From Part 6K?

Protocol examples:

If it appears that phytotoxicity has resulted from applications made in this trial, contact the Study Director. If possible, take one or more photographs and send them to the Study Director via email to facilitate the evaluation of crop/ test substance effects.

**Please note: At the request of the registrant, crop injury data will be collected after each test substance application. Specify the type of injury (leaf burn, leaf cupping or twisting, chlorosis, necrosis, etc.) and assess if this level of injury is commercially acceptable. Specify the method used to determine extent of injury (e.g. 0 = no damage, 10 = plant death). If any injury is observed, contact the Study Director and include photographs of the injury.**

SOP example 1:

1. **PURPOSE**
   To establish procedures for observing and reporting phytotoxicity

2. **SCOPE**
   All trials conducted according to Good Laboratory Practice (GLP) standards

3. **PROCEDURES**
   - 3.1. Within three weeks after an application of the test substance to a test system, unless otherwise detailed in the protocol, look closely at the test system paying close attention to any distortion (twisting, turning, curling, drooping), any discoloration or burning, or spotting of leaves or any other unusual appearance of the plants. If in question, contact a crop expert and ask their opinion.
   - 3.2. In the event that an aberration is noted that may be related to the test substance, carefully write a description of the appearance including part(s) of the plant affected, color and distortion(s).Compare the affected plants with healthy plants in the non-treated plots.
   - 3.3. If at all possible, photograph the affected parts of the plants and healthy plants for comparison. Submit the photos with the field data notebook.
   - 3.4. Contact the study director, sending photos (if available) and a description via email.
   - 3.5. If the trial goes to completion, attempt to estimate the effects on yield if possible.
   - 3.6. If ratings are required by the protocol:
     - 3.6.1. Review the protocol to determine the method and timing of collecting phytotoxicity data. If no method is cited, follow the procedure below:
     - 3.6.2. When possible, record phytotoxicity data at an appropriate time after the application
     - 3.6.3. Observe all plots and rate the phytotoxicity on a scale of 0 to 100%. Zero percent = no phytotoxicity and 100% = completely dead. The rating between 0 and 100% indicates the degree of injury expressed as stunting, necrosis, chlorosis, leaf deformation, etc.
     - 3.6.4. Document the use of other rating scales.

SOP example 2:

Phytotoxity Data

1) Consult the study protocol and any data collection forms to determine the method and timing of data collection. If no method is cited, then reference an alternative method or proceed with the following steps.

2) Unless otherwise specified in the study protocol, collect phytotoxicity data 24 hours prior to the pesticide treatment and within 48 hours after the treatment, 1 week later, and at the termination of the study. If significant symptoms occur during this period, then additional phytotoxicity data should be taken.

3) Define symptoms of phytotoxity (i.e. chlorosis, necrosis, stunting).

4) Randomly select 5 plants in the middle row of each plot and record a phytotoxicity rating of 0 to 10 for each plant. If there are less than five plants/row, record data from 5 plants/plot or all the plants in a plot. The following, or an alternative, scale may be used:

    a. 0 = healthy plant; no symptoms of phytotoxity
    b. 10 = dead plant; phytotoxity has resulted in death of plant
    c. 1-9 = the percentage of plant tissues displaying symptoms

5) Record the scale used for rating phytotoxity.

***Topic #6 Documenting Phytotoxicity*** - Response summary

Scenario – Some protocol requested specifically for phytotoxicity ratings. FRDs generally have their SOPs for observing and reporting phytos. Form Part 6 K – Post Treatment Record has prompts/space for recording phytos. Below are two examples of protocol requirements and two SOPs. In both cases, FRD recorded 'NO' in Form Part 6K. Please discuss whether it was adequate to meet the protocol/SOP requirements. For future improvements, what are the recommendations/suggestions for the protocol, SOP, and FDB Part 6K?

- The second SOP provides more clear detail of what should be recorded for phytotoxicity and when, unless it is otherwise specified in the protocol.
- The 0-10 scale is more commonly used to report phytotoxicity compared with 0-100%.
- Can be difficult to differentiate between phytotoxicity, disease, mechanical damage,etc.
- It is helpful to include references in SOP for reporting phytotoxicity in different cropping systems (see Puerto Rico's).
- Include pictures to Study Director and in FDB if phytotoxicity us observed.
- Important to consider the effects over time – may observe phytotoxicity early in the trial (1$^{st}$ and 2$^{nd}$ app), but does the crop rebound? Is marketable yield affected? These are the overall important findings to include in a report.
- Not commonly reported in GLP residue studies, more often in performance trials.

# TABLE 7

# Drying Samples

| NAME | SIGNATURE |
|---|---|
| Will Meeks | WM 2-26-20 |
| Roger B Batts | Roger B Batts |
| Jennifer Fisher | Jennifer Fisher |
| Somsong Jarman | |
| Wilson Peng | Wilson S. Peng 2/26/20 |
| Faradeh Rehfield | |
| Grace Lennon | Grace 2/26/20 |
| | Graham 2/26/20 |
| Jenny Ansite | Jenny Ansite |
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Topic 7/Table 7
Drying Samples:

Scenarios: Some protocol requested raw commodity to be dried. In commercial production, there was a standard for acceptable moisture content in dried commodity, though one might argue that it could be quite variable. IR-4 protocol rarely addressed the moisture content in dried samples. Below are examples of IR-4 protocol and two SOPs. At field, some FRDs dried down 9 lbs of fresh basil to 1 lbs of dried basil, while others might get 3 lbs of dried basil from 7 lbs of fresh basil. Please discuss the situations and what could be recommended for future improvements in protocols and SOPs.

Protocol Example:

**Dried Samples (all trials):** At one day after the last application, harvest additional fresh basil for production of dried basil samples. Follow the above general procedures for sample collection. Collect two untreated and two treated samples and deliver to the drying facility within 48 hours of harvest. Collect enough fresh material to provide a minimum of 1 lb per dried sample. In all trials, untreated samples for drying may be collected up to 3 days prior to the treated samples for drying. In order to prevent contamination, untreated samples should be dried separately from treated samples. It is preferable to collect more than the minimum weight of untreated samples, up to 2 lbs dried, but this is not a requirement. Storage prior to drying should be at ambient temperatures (do not freeze) and the temperatures should be monitored and recorded. The recommended drying practice is in a forced-air drier at 90-100 °F for approximately 24 hours, but the drying temperature may be as high as 130 °F if the outside environment is humid. The plants should be spaced in the dryer such that all sides receive sufficient air flow to permit even drying.

**20.17- For the dried basil samples, include data collected during sample drying, including a description of the drying method, length of drying time and procedures to keep samples separate and prevent contamination**

SOP 1.

PROCEDURE:

1.0 General Drying Procedures

1.1 Preparing the RAC 1.1.1 Adequate amounts of the commodity will be collected first from the untreated plot and then from the treated plot to ensure that the protocol minimum weights for the dried commodity are obtained. 1.1.2 Samples will be kept separate to prevent contamination, and maintained according to the protocol specifications between harvesting and drying

1.2 Moisture Verification 1.2.1 Prior to drying the RAC samples, pre-sample determination lots will be completely dried down (until consecutive weight readings are within approximately 1%) to determine the dry weight of the commodity. This dry weight will be used to calculate the target weights for the actual RAC samples according to the procedure in 4.0 below). The raw data will be included in the Field Data Notebook.

1.3 Drying 1.3.1 Samples will be dried in separate areas to prevent contamination. If using forced air dryers, the untreated and the treated samples will be dried in separate dryers. 1.3.2 Drying areas will be cleaned appropriately before use (e.g. dryers will be swept out and the metal trays will be rinsed off with water or wiped down with a damp towel). 1.3.3 Samples will be dried according to protocol specifications. Weights will be recorded before drying, at appropriate intervals, and at completion of drying. Drying temperatures will be monitored and recorded. The raw data will be included in the Field Data Notebook.

SOP 2

13) If a sample is to be dried, check the protocol for specific directions. If none are given, follow the procedure used by local growers of the commodity.
   a. Use a temperature logger to record the temperature of the drying oven/greenhouse where the commodity is dried. Accuracy of temperature will be checked by comparison with a NIST traceable thermometer.
   b. If a suitable moisture meter capable of being calibrated is available, it is satisfactory to use the meter to determine moisture content of the sample.
   c. If a moisture meter is not available, use a drying oven. Record container weight and sample weight. Place in the drying oven over night at 160-170°F. Weigh the samples at regular intervals and calculate the moisture content. When the desired moisture content is reached, remove samples from the dryer.
   d. Some samples may only need 2 to 4 hours to dry down to 8-12% moisture.

No PRE-drying down process

Can be problematic with different matrices

Topic 7/Table 7
Drying Samples:

Scenarios: Some protocol requested raw commodity to be dried. In commercial production, there was a standard for acceptable moisture content in dried commodity, though one might argue that it could be quite variable. IR-4 protocol rarely addressed the moisture content in dried samples. Below are examples of IR-4 protocol and two SOPs. At field, some FRDs dried down 9 lbs of fresh basil to 1 lbs of dried basil, while others might get 3 lbs of dried basil from 7 lbs of fresh basil. Please discuss the situations and what could be recommended for future improvements in protocols and SOPs.

Protocol Example:

**Dried Samples (all trials):** At one day after the last application, harvest additional fresh basil for production of dried basil samples. Follow the above general procedures for sample collection. Collect two untreated and two treated samples and deliver to the drying facility within 48 hours of harvest. Collect enough fresh material to provide a minimum of 1 lb per dried sample. In all trials, untreated samples for drying may be collected up to 3 days prior to the treated samples for drying. In order to prevent contamination, untreated samples should be dried separately from treated samples. It is preferable to collect more than the minimum weight of untreated samples, up to 2 lbs dried, but this is not a requirement. Storage prior to drying should be at ambient temperatures (do not freeze) and the temperatures should be monitored and recorded. The recommended drying practice is in a forced-air drier at 90-100 °F for approximately 24 hours, but the drying temperature may be as high as 130 °F if the outside environment is humid. The plants should be spaced in the dryer such that all sides receive sufficient air flow to permit even drying.

**20.17- For the dried basil samples, include data collected during sample drying, including a description of the drying method, length of drying time and procedures to keep samples separate and prevent contamination**

SOP 1.

PROCEDURE:

1.0 General Drying Procedures

1.1 Preparing the RAC 1.1.1 Adequate amounts of the commodity will be collected first from the untreated plot and then from the treated plot to ensure that the protocol minimum weights for the dried commodity are obtained. 1.1.2 Samples will be kept separate to prevent contamination, and maintained according to the protocol specifications between harvesting and drying

1.2 Moisture Verification 1.2.1 Prior to drying the RAC samples, pre-sample determination lots will be completely dried down (until consecutive weight readings are within approximately 1%) to determine the dry weight of the commodity. This dry weight will be used to calculate the target weights for the actual RAC samples according to the procedure in 4.0 below). The raw data will be included in the Field Data Notebook.

1.3 Drying 1.3.1 Samples will be dried in separate areas to prevent contamination. If using forced air dryers, the untreated and the treated samples will be dried in separate dryers. 1.3.2 Drying areas will be cleaned appropriately before use (e.g. dryers will be swept out and the metal trays will be rinsed off with water or wiped down with a damp towel). 1.3.3 Samples will be dried according to protocol specifications. Weights will be recorded before drying, at appropriate intervals, and at completion of drying. Drying temperatures will be monitored and recorded. The raw data will be included in the Field Data Notebook.

SOP 2

13) If a sample is to be dried, check the protocol for specific directions. If none are given, follow the procedure used by local growers of the commodity.
    a. Use a temperature logger to record the temperature of the drying oven/greenhouse where the commodity is dried. Accuracy of temperature will be checked by comparison with a NIST traceable thermometer.
    b. If a suitable moisture meter capable of being calibrated is available, it is satisfactory to use the meter to determine moisture content of the sample.
    c. If a moisture meter is not available, use a drying oven. Record container weight and sample weight. Place in the drying oven over night at 160-170°F. Weigh the samples at regular intervals and calculate the moisture content. When the desired moisture content is reached, remove samples from the dryer.
    d. Some samples may only need 2 to 4 hours to dry down to 8-12% moisture.

a Samples will be dried according to protocol Specs

SOP 1- gives a little more flexibility to allow for the different drying methods implemented for the various crops. We noticed the different crops have different drying methods according to the regs

SOP 2- does not allow for ~~flex~~ flexibility

***Topic #7 Drying Samples*** - Response summary

Scenario – Some protocol requested raw commodity to be dried. In commercial production, there was a standard for acceptable moisture content in dried commodity, though one might argue that it could be quite variable. IR-4 protocol rarely addressed the moisture content in dried samples. Below are examples of IR-4 protocol and two SOPs. At field, some FRDs dried down 9 lbs of fresh basil to 1 lbs of dried basil, while others might get 3 lbs of dried basil from 7 lbs of fresh basil. Please discuss the situations and what could be recommended for future improvements in protocols and SOPs.

**Protocol:**

- If Fed requirements list specific instructions, the protocol needs to include it.
- Can protocol allow open air drying? Will EPA allow it?
- Good to keep record of temperature of samples after harvest/before drying. Record dates they are dried down.

**SOP #1:**

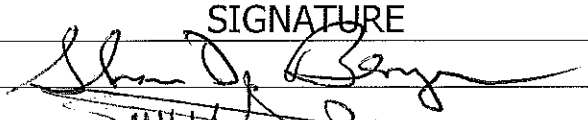
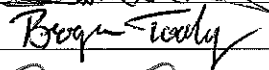
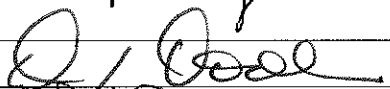
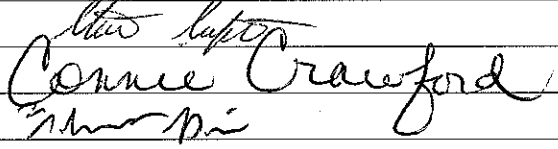
- "Sample will be dried according to protocol specifications." Gives a little more flexibility to allow for the different drying methods implemented of the various crops. We noticed the different crops have different drying methods according to the requirements.

**SOP #2:**

- Does not allow for flexibility
- No pre-dry down process
- Utilizing a suitable moisture meter can be troublesome with different matrices

# TABLE 8

# Planning for the Season

| NAME | SIGNATURE |
|---|---|
| Sharon Benzen |  |
| Simon Zebelo | |
| Brogan Tooley |  |
| Marisol Quintanilla | |
| Douglas Doohan |  |
| Dani Lightle | |
| Steven Seefeldt | |
| Connie Crawford |  |
| Thomas Pike | |
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Planning for a New Season

How do you plan for a successful year conducting GLP trials? Below is a list of some things to consider. Please share the ways you prepare, understand and organize. You have received the list of trials you will be conducting.

What can you start doing even before a draft protocol is out?
Group like trials together - early/mid/late season
Can I actually grow the crops
Off-season maintenance tasks
plan out rough timings of important events (planting/harvest)
Select varieties

Draft protocol is out. Review it and contact your Study Director with ANY questions you have.
Plot size ≥ 0.1 ac to plan amt of test substance
Let SD know if trial differentiation will be a problem
Make sure you have enough plants planted to get minimum sample size

Can you perform the application type? You have been provided with IR-4 Advisory #2004-02 Application Type Definitions.

Is it typical of your area?

Do you fully understand what the application type is? Be sure! Especially if it is an odd application type. And, remember terminology differs across regions. (Is in-furrow where the seeds or plants are placed or is it between rows?) What should you do if you do not understand it?
Talk to Study Director
other FRDS
Regional Field Coordinators
other University researchers

Do you know how to calculate tank mix for the application type? Be sure! (Is treated area the same as plot area?) Miscalculations are one of major reasons trials fail

Can you complete the use pattern in your growing season?
Ask growers about cycle
SD may not know climate or how to grow that crop
what are risks of early frost

Can you grow the crop to simulate commercial practice for your area?
Growing practices for a crop may differ by growing region

Can you grow enough crop to assure meeting samples requirement? Common problem from FRDs
One of biggest reasons trials fail

Do you have enough space to assure adequate buffers? Are there other things you can do to prevent contamination by drift? make sure far enough apart to not contaminate controls
make sure have space around edges of plot

If you have more than one trial under the same protocol, how can you differentiate? You have been provided with the acceptable options for differentiation.
Talk to study director because can cause failed trials

Other things to think about: Time involved in plot maintenance

***Topic #8 Planning for the Season*** - Response summary

Scenario – How do you plan for a successful year conducting GLP trials? Below is a list of some things to consider. Please share the ways you prepare, understand and organize. You have received the list of trials you will be conducting.

1) **What can you start doing even before a draft protocol is out?**
    - Group like trials together (i.e., early, mid, late season)
    - Does the FRD have the abilities, correct locality, etc. to grow the crop
    - Off-season maintenance tasks
    - Plan out rough timings of important events (planting, harvest)
    - Select varieties
2) **Draft protocol is out. Review it and contact your Study Director with ANY questions you have.**
    - Plot size > 0.1 ac to plan amount of test substance
    - Let SD know if trial differentiation will be a problem
    - Make sure you have enough plants planted to get minimum sample size
3) **Can you perform the application type? You have been provided with IR-4 Advisory #2004-02 Application Type Definitions.**
4) **Is it typical of your area?**
5) **Do you fully understand what the application type is? Be sure! Especially if it is an odd application type. And, remember terminology differs across regions. (Is in-furrow where the seeds or plants are placed or is it between rows?) What should you do if you do not understand it?**
    - Talk to Study Director, other FRDs, Regional Field Coordinators, other university researchers
6) **Do you know how to calculate tank mix for the application type? Be sure! (Is treated area the same as plot area?)**
    - Miscalculations are one of major reasons trials fail
7) **Can you complete the use pattern in your growing season?**
    - Ask growers about growing season/cycle
    - SD may not know climate or how to grow that crop
    - Know what are risks associated with timing of planting in the field, i.e., early frost
8) **Can you grow the crop to simulate commercial practice for your area?**
    - Growing practices for a crop may differ by growing region
9) **Can you grow enough crop to assure meeting samples requirement?**
    - Common problem from FRDs, one of biggest reasons trials fail
10) **Do you have enough space to assure adequate buffers? Are there other things you can do to prevent contamination by drift?**
    - Make sure for enough apart to not contaminate controls
    - Make sure have space around edges of plot

11) **If you have more than one trial under the same protocol, how can you differentiate? You have been provided with the acceptable options for differentiation.**
    - Talk to Study Director because can cause failed trials

*Also need to consider time involved in plot maintenance.

# TABLE 9

# Modifying Samples

| NAME | SIGNATURE |
|---|---|
| Clark Oman | |
| James Kam | |
| Susan Stevenson | |
| Nicole Soldan | |
| Luis Almodovar | |
| Thomas Wixon | |
| Martin Beran | |
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Topic 9/Table 9

Sample Modifications (This topics have two scenarios):

Scenario 1: A protocol states to "reduce gross sample weight to a minimum of 2 lbs (but preferably not more than 4 lbs) by cutting each head longitudinally into quarters with a clean knife on an uncontaminated surface. Retain at least one quarter of each head." The FRD records that lettuce roots are removed and the sample weights are around 3 lbs without quartered. A Field Raw Data Audit determines that 'it seems the leaf lettuce samples were not quartered. The Protocol asks that you reduce sample weight by cutting the lettuce into quarters, retaining at least one quarter. This is a Protocol Deviation. Please submit a Deviation form to the Study Director.' Based on the information presented, is this a Protocol Deviation? How could the sampling statement in the protocol be more clearly defined?

Protocol Example 1:

**All trials:** Remove dead and/or senesced leaves. DO NOT TRIM.

If excessive soil adheres to the foliage, remove it by lightly brushing it off (document what is used to remove the soil or debris, e.g. a clean brush, clean gloved hand, clean dry towel, or similar method). If necessary, lightly rinse off with a minimal amount of clean water (do not scrub). Pat lightly while drying with clean paper towels. DO NOT RUB WHILE RINSING OR DRYING THE LEAVES.

Reduce gross sample weight to a minimum of 2 lbs (but preferably not more than 4 lbs) by cutting each head longitudinally into quarters with a clean knife on an uncontaminated surface. Retain at least one quarter of each head. Process the untreated samples first. For samples with wrapper leaves be sure to retain these leaves. Record the length of time from completion of the sample reduction to placement in a cooler for each sample in Field Data Book Part 7.A.2.

In this case it is best to contact the Study Director for clarification. The wording in the protocol is a bit misleading. Was the intent that regardless of sample weight, the heads should be quartered or was the intent that *if* sample reduction was necessary, the heads should be quartered and at least one quarter retained?

**Title:** Reducing residue sample weight/size by cutting.

**Purpose:** To assure the integrity of the residue samples that are reduced in weight and/or size after collection (harvest).

**Scope:** All locations where residue samples are collected.

**Procedures:**

1. Consult the study protocol for any postharvest handling request and/or requirements of residue samples.

2. Follow the protocol and/or record in the data book the procedure used to reduce the weight and/or size of the residue samples and to ensure integrity of those samples.

3. If the protocol does not specify the order in which the samples are to be reduced in weight and/or size begin with the non-treated controls first, then the 1x, then the 2 x, etc. Sample each replicate individually beginning with the nontreated plots and working up to the highest dosage. Treatments from each replicate should be individually packaged and labeled.

4. Take special care to do the following in the sample reduction process:
   a. Avoid contamination of the non-treated field samples with the test substance during the sample weight and/or size reduction (e.g., cutting) process.
   b. Take care not to remove surface residues during handling and weight and/or size reduction process. Gloves should be worn and change gloves and clean cutting implement(s) and cutting surface area between samples.
   c. Do not remove any soil or plant parts or trim the commodity unless it is so specified in the study protocol (e.g., leave outer leaves of lettuce.)
   d. Be careful to keep track of residue samples, i.e., remove harvested sample from plastic-bags one sample at a time, reduce sample in weight and/or size by cutting of the fruit from that sample, and then replace the reduced sample into the original sample bag. Reduced samples may be placed in Zip Loc plastic bags and then placed in the residue sample bags.

Scenario 2: Some protocol requested sample modifications to reduce the sample weight and/or remove undesirable parts. Protocol usually gave quite specific instructions of sample modifications, as indicated below. FDB also prompted for brief descriptions of sample collection and modifications. However, rarely have FRD's SOPs covered the procedures of sample modifications. In many cases, sample sizes were still too large (i.e., 20 lbs) after following protocol procedures. This has caused some lab concerns when processing the samples. Please review the protocol and make suggestions, if any, to address lab concerns. Do you consider a separate SOP, besides harvesting/samping, is needed to cover the procedure? Please discuss and recommend any future changes of protocol and SOPs for improvements.

Protocol Example 2:

**17. RESIDUE SAMPLE COLLECTION:**

Collect two samples from each plot. Each sample should be representative of the entire plot (except plot ends). At 1 day after the last application, starting with the untreated plot, collect at least 24 fruits from at least 4 trees. Each sample should be collected during a separate run through the entire plot. At least one fruit from each tree should be impartially picked from high, low, sheltered and exposed throughout the treated plot excluding the end trees. Avoid sampling from row ends.

Remove pits from fruit and sample at least 4 lb of fruit (but preferably not more than 8 lb). **If the sample size before pit removal is much greater than 8 lb, then preferably the fruits will be quartered (cut from stem end to opposite end into four pieces) and the opposite quarters retained for the sample**. If pit removal is done at a different location than the plots, then the harvested fruit should be protected from any excessively high temperatures during transport between the two places and appropriately documented.

Opposite quarters

Process untreated sample first. Record the length of time from completion of the pit removal and/or sample reduction to placement in a cooler for each sample in Field Data Book Part 7.A.2.

Follow proper handling practices with clean or gloved hands and clean tools to prevent transfer of pesticide residue from one sample to another. If practical, complete harvest and sample preparation for the untreated plot(s) before proceeding to the treated plot(s).

**18. FIELD RESIDUE SAMPLE INVENTORY:**

| SAMPLE ID | TRT# | TREATMENT | DAYS AFTER LAST APPLIC. | MINIMUM SAMPLE SIZE | CROP FRACTION |
|---|---|---|---|---|---|
| A | 01 | Untreated | NA | 24 fruits / 4 lb. | Fruit |
| B | 01 | Untreated | NA | 24 fruits / 4 lb. | Fruit |
| C | 02 | FLONICAMID | 1 | 24 fruits / 4 lb. | Fruit |
| D | 02 | FLONICAMID | 1 | 24 fruits / 4 lb. | Fruit |

Sample SOP 1:

Example SOP 2.

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 unwashed 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 with at least the following information:

3.1 Field ID Number/crop/test substance 3.2 Field Research Director 3.3 Sample ID/treatment # /crop fraction 3.4 Date sampled/harvested

4.0 An additional sample identification label will be placed inside the sampling bag. This label shall be enclosed in a moisture-proof container (e.g. plastic zip-lock bag), and will contain the same information as outside label. Alternatively, the trial number and sample identification may be written on the outside of the sample bag in 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. A non-GLP compliant balance may be used to determine sample weights.

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.

8.0 Contamination of the sample in any way shall be avoided during the sampling, 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 8.4 Tools will be cleaned prior to use and between samples 8.5 Soil or plant parts will not be removed from the raw agricultural commodity, or the commodity trimmed, unless required/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, 1) Control and treated samples should be placed in separate containers with ice or ice substitute to preserve the samples prior to frozen storage, if possible,

and 2) Temperatures of the samples will be monitored with an appropriate device such as a min/max thermometer or a hobo data logger. Samples of different treatment doses will be transported in a manner that will avoid the potential of cross contamination of samples. Exceptions might include crop samples that must be dried or processed such as grains, beans, nuts and cotton.

We feel that a general SOP on procedures of sample modifications is unhelpful. Different commodities are handled very differently and should be treated case by case. That said, if an FRD frequently deals with specific crops that require specific modifications/handling (i.e. coffee, cherries, etc.) a specific SOP to outline their procedures is recommended.

If the protocol is not specific enough or if the FRD has any questions regarding sample processing, these issues should be addressed with the SD preferably at the protocol draft stage. The FRD has first hand knowledge of the crops they are working with and should read the protocol carefully to foresee any potential problems. An example of this would be avocado. Avocado varieties vary greatly in size. In the larger varieties, the samples could be greatly over requested weight limit even after following protocol requirement to quarter and keep opposite quarters. If an FRD knows they will be growing a larger variety, ask SD if it is acceptable to keep opposite 1/8 or a single 1/4.

The FRD should read the protocol thoroughly and let the SD know if they foresee any potential problems. The SD should write the protocol in a manner that that is clear, specific and concise. This is especially true of crops that can be challenging for the labs to process. Examples of large, difficult crops: melon, sugar beet, some avocado varieties, head lettuce, apples. The protocol should specifically address if samples should be halved regardless of size and provide options to reduce sample size to an appropriate weight.

***Topic #9 Sample Modifications*** - Response summary

Scenario 1 – A protocol states to "reduce gross sample weight to a minimum of 2 lbs (but preferably not more than 4 lbs) by cutting each head longitudinally into quarters with a clean knife on an uncontaminated surface. Retain at least one quarter of each head." The FRD records that lettuce roots are removed and the sample weights are around 3 lbs without quartered. A Field Raw Data Audit determines that 'it seems the leaf lettuce samples were not quartered. The Protocol asks that you reduce sample weight by cutting the lettuce into quarters, retaining at least one quarter. This is a Protocol Deviation. Please submit a Deviation form to the Study Director.' Based on the information presented, is this a Protocol Deviation? How could the sampling statement in the protocol be more clearly defined?

Scenario 2 – Some protocol requested sample modifications to reduce the sample weight and/or remove undesirable parts. Protocol usually gave quite specific instructions of sample modifications, as indicated below. FDB also prompted for brief descriptions of sample collection and modifications. However, rarely have FRD's SOPs covered the procedures of sample modifications. In many cases, sample sizes were still too large (i.e., 20 lbs) after following protocol procedures. This has caused some lab concerns when processing the samples. Please review the protocol and make suggestions, if any, to address lab concerns. Do you consider a separate SOP, besides harvesting/sampling, is needed to cover the procedure? Please discuss and recommend any future changes of protocol and SOPs for improvements.

**Scenario 1:** In this case it is best to contact the Study Director for clarification. The wording in the protocol is a bit misleading. Was the intent that regardless of sample weight, the heads should be quartered or was the intent that if sample reduction was necessary, the heads should be quartered and at least one quarter retained?

**Scenario 2:** We feel that a general SOP on procedures of sample modifications is unhelpful. Different commodities are handled very differently and should be treated case by case. That said, if an FRD frequently deals with specific crops that require specific modifications/handling (i.e. coffee, cherries, etc.) a specific SOP to outline their procedures is recommended. If the protocol is not specific enough or if the FRD has any questions regarding sample processing, these issues should be addressed with the SD preferably at the protocol draft stage. The FRD has first-hand knowledge of the crops they are working with and should read the protocol carefully to foresee any potential problems. An example of this would be avocado. Avocado varieties vary greatly in size. In the larger varieties, the samples could be greatly over requested weight limit even after following protocol requirement to quarter and keep opposite quarters. If an FRD knows they will be growing a larger variety, ask SD if it is acceptable to keep opposite 1/8 or a single 1/4. The FRD should read the protocol thoroughly and let the SD know if they foresee any potential problems. The SD should write the protocol in a manner that that is clear, specific and concise. This is especially true of crops that can be challenging for the labs to process. Examples of large, difficult crops: melon, sugar beet, some avocado varieties, head lettuce, apples. The protocol should specifically

address if samples should be halved regardless of size and provide options to reduce sample size to an appropriate weight.

# TABLE 10

# Test Substance Measurement

| NAME | SIGNATURE |
|---|---|
| Jenny Ansite | |
| Seth Watkins | |
| Martha Sylvia | |
| Andy Doklovic | |
| Justin DeMaagd | |
| Duane Larson | |
| Kathleen Knight | |
| Christine Gagnon | |
| | |
| Van Starner | |
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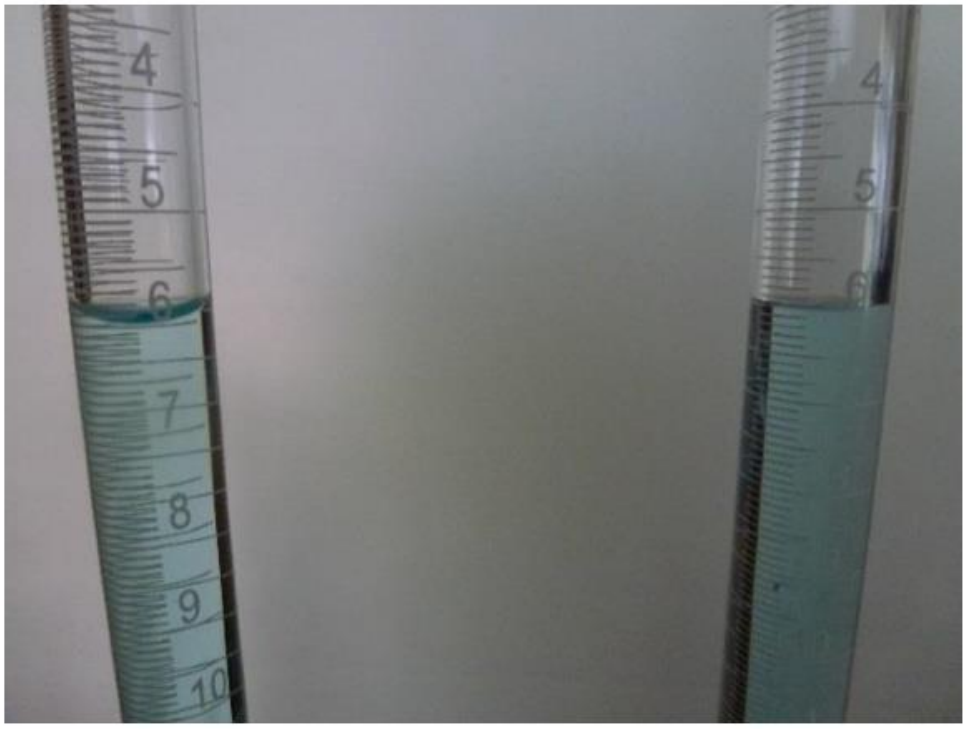
Scenario: An FRD recorded the application information in Part 6G with following measurements: Carrier (water): 10432.5 ml, test substance 101.5 mL, adjuvant 66 ml, and total volume 10,600 ml. Graduated cylinders were used: 4000 ml with 50 ml increment for carrier, and 250 ml with 5 ml increment for TS and adjuvant. IR-4 protocol didn't specify measuring/weighing instruments. The SOP (see example) for measuring liquid formulations stated that the measuring device should be "large enough to hold the volume of liquid to be measured, graduated in increments small enough to read to an accuracy within +/- 5% of the volume measured." Based on the information presented, was this an SOP Deviation? Is it acceptable to estimate .5 mL in a graduated cylinder with 50 ml/5 mL increments? Which graduated cylinders should the FRD have used to report these measurements? Please discuss and make recommendations.

Additional background information regarding measurement with graduated cylinders:

The volume of liquid in a graduated cylinder is obtained directly by reading the calibrated scale. In most situations, the liquid will be water or an aqueous solution. If the cylinder is made from glass, the liquid surface is curved (U-shaped) rather than horizontal, due to the relatively strong attractive force between water and glass. The curved surface is called the meniscus—cylinder on the left in the following figure. As a general rule, the bottom of the meniscus is taken as the liquid level in a glass cylinder (or any other volume measuring device made from glass). If the cylinder is made from plastic, the liquid surface is flat (horizontal). There is no meniscus—cylinder on the right in the following figure.




The scale divisions on a graduated cylinder are generally determined by its size. For example, the 50-mL graduated cylinder is divided into 1 mL increments. However, the scale of a 10-mL graduated cylinder is

divided into 0.1 mL increments, and the scale of a 500-mL graduated cylinder is divided into 5 mL increments.

The graduated cylinder scale is a ruled scale, and it is read like a ruler. The scale is read to one digit beyond the smallest scale division by estimating (interpolating) between these divisions. With a 50-mL graduated cylinder, read and record the volume to the nearest 0.1 mL. The 10-mL graduated cylinder scale is read to the nearest 0.01 mL and the 500-mL graduated cylinder scale is read to the nearest milliliter (1 mL).

SOP example

**Title:** Measuring liquid formulations.

**Purpose:** To assure an accurate measurement of liquid test substances.

**Scope:** Sites conducting trial(s) to obtain registration of pesticides under GLP guidelines.

**Procedures:**

1. Obtain a clean measuring device (i.e. graduated cylinder, syringe or micropipette) large enough to hold the volume of liquid to be measured, graduated in increments small enough to read to an accuracy within +/- 5% of the volume to be measured (i.e. if 3 ml is needed, use a 5 ml syringe having 0.1 ml divisions or if 0.5 ml is needed, use a 1 ml syringe having 0.01 ml divisions).

2. If the opening of the cylinder/device is too restricted to allow filling without danger of spillage, then do one of the following:

   a. Use a clean container with a pour lip as an intermediate and fill the cylinder/device from it.

   or

   b. Use a clean funnel that is large enough to allow filling the cylinder with a minimum of spillage.

3. Use appropriate safety equipment while measuring liquids.

4. If measuring the liquid in the graduated cylinder, then place the cylinder/device on a level surface and take the reading of the liquid in the cylinder/device at the bottom of the meniscus with the eye being level with the bottom of the meniscus. If using a syringe, take the measurement reading from the bottom of the plunger head. Document the amount of test substance measured in the raw data book.

5. Pour the liquid into an appropriate container, fit with a leak proof lid and label as to contents and amount.

6. Cylinders/devices used to measure or transfer the test substance concentrate should be triple rinsed into the mixing container and then thoroughly washed with cleanser (i.e. dish soap, ammonia cleaner) and water after use to ensure that they are clean and cross contamination of pesticides will not occur in future use.

7. If excess test material is withdrawn from the container, do not place it back into the original container to avoid possible contamination of the test substance. The excess material is labeled as 'waste' and the amount documented in the chemical use log. The waste material may be disposed of by following disposal procedure on the pesticide label or diluted following label or protocol instructions and applied on overplanting of a crop.

FIELD ID NO: _____

# Description of Equipment Used to Measure Test Substances, Adjuvant and Carrier

**Application No**._____

The syringes used to measure test substances, adjuvants and/or to remove water are 1, 3, 5, 10 and 60 mls. The 1 ml syringe measures in 0.01 ml increments, 3 ml syringe measures in 0.1 ml increments, 5 ml and 10 ml syringes measure in 0.2 ml increments, and the 60 ml syringe measures in 1 ml increments. The following syringes were used in this study:

| **Test Substance** | **Adjuvant** | **Removed Water** |
|---|---|---|
| ____ 1 ml | ____ 1 ml | ____ 1 ml |
| ____ 3 ml | ____ 3 ml | ____ 3 ml |
| ____ 5 ml | ____ 5 ml | ____ 5 ml |
| ____ 10 ml | ____ 10 ml | ____ 10 ml |
| ____ 60 ml | ____ 60 ml | ____ 60 ml |

The graduated cylinders used to measure test substance, adjuvant, carrier and remove water when applicable are 25 ml with 0.2 ml increments, 100ml with 1 ml increments, 250 ml with 2 ml increments, 500 ml with 5 ml increments, 1000 ml with 10 ml increments, 2000 ml with 20 ml increments and 4000 ml with 50 ml increments. The following graduated cylinders were used in this study:

| **Test Substance** | **Adjuvant** | **Carrier Water** | **Removed Water** |
|---|---|---|---|
| ____ 25 ml | ____ 25 ml | ____ 25 ml | ____ 25 ml |
| ____ 100 ml | ____ 100 ml | ____ 100 ml | ____ 100 ml |
| ____ 250 ml | ____ 250 ml | ____ 250 ml | ____ 250 ml |
| ____ 500 ml | ____ 500 ml | ____ 500 ml | ____ 500 ml |
| ____ 1000 ml | ____ 1000 ml | ____ 1000 ml | ____ 1000 ml |
| ____ 2000 ml | ____ 2000 ml | ____ 2000 ml | ____ 2000 ml |
| ____ 4000 ml | ____ 4000 ml | ____ 4000 ml | ____ 4000 ml |

**Equipment used to measure dry formulation**: Scale Sartorius BP3100 S ____

Above data entered by: _____ Date: _____

COMPLETE IF APPROPRIATE: ATHIS IS A TRUE, EXACT COPY OF THE ORIGINAL.

THE ORIGINAL IS IN _____ INITIALS _____ DATE _____

Kathleen: EPA is contentious about weighing test substances

- EPA will catch any weigh differences between equipment + protocol

S: 10,600 mL

Yes it is an SOP deviation.

Not acceptable to estimate 0.5mL in a graduated cylinder. Use within scope of equipment available. Round to even #s

- The SOP may contain ~~more verbage than necessary~~ restrictive verbage
- Some language in SOP is ambiguous

Corrective
- Scenario
  - Report deviations to SD
  - Measure out 10,600 mL $H_2O$
  - Extract appropriate amount to mix test substance (167.5mL) using a measuring device capable to measure at 0.5mL increments
  - Document equipment that was used to measure + mix test substances

***Topic #10 Sample Modifications*** - Response summary – Yes, it is an SOP deviation.

Scenario – An FRD recorded the application information in Part 6G with following measurements: Carrier (water): 10432.5 ml, test substance 101.5 mL, adjuvant 66 ml, and total volume 10,600 ml. Graduated cylinders were used: 4000 ml with 50 ml increment for carrier, and 250 ml with 5 ml increment for TS and adjuvant. IR-4 protocol didn't specify measuring/weighing instruments. The SOP (see example) for measuring liquid formulations stated that the measuring device should be "large enough to hold the volume of liquid to be measured, graduated in increments small enough to read to an accuracy within +/- 5% of the volume measured." Based on the information presented, was this a SOP Deviation? Is it acceptable to estimate .5 mL in a graduated cylinder with 50 ml/5 mL increments? Should the FRD use multiple graduated cylinders in measurements, i.e., to make 10,432.5 ml using 4,000 ml x 2, 1000 ml x 2, 200 ml x 2, 20 ml + 10 ml/20 ml, and 2.5 ml/5 ml? Please discuss and make recommendations.

- EPA is contentious about weighing test substances – EPA will catch any weight differences between equipment and protocol
- Not acceptable to estimate 0.5ml in a graduated cylinder. Use within the scope of equipment available. Round to even #s.
- The SOP may contain restrictive verbage, or on the other hand some language in SOP is ambiguous.

*Corrective Action:

- Report deviations to SD
- Measure out 10,600 ml water
- Extract appropriate amount to mix test substance (167.5 ml) using a measuring device capable to measure at 0.5 ml increments
- Document equipment that was used to measure and mix test substance