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**Item ID Number:** 00042

**Author:** Currie, D.J.

**Corporate Author:** Defense Research Establishment Suffield; Ralston; Alberta

**Report/Article Title:** Downwind Travel of Herbicides (U): Procedures to be Used in Trials 4-11, Filed Experiment No. 593)

**Journal/Book Title:**

**Year:** 1970

**Month/Day:** May

**Color:**

**Number of Images:** 9

**Description Notes:** Project No. D-20-50-09

AD 872227

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DOWNWIND TRAVEL OF HERBICIDES (U)

(Procedures to be used in Trials 4-11,  
Field Experiment No. 593)

Prepared by

D.J. Currie

PROJECT NO. D-20-50-09

May 1970



DEFENCE RESEARCH ESTABLISHMENT SUFFIELD : RALSTON : ALBERTA

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SUFFIELD MEMORANDUM NO. 18/70

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1. REFERENCES

- a. Saskatchewan Research Council (SRC) letter dated 14 May 69 (DRES 221-50/3)
- b. Proposed pesticide field trial program, prepared by SRC 23 June 69
- c. DRB 6800-1-1 dated 3 July 69
- d. Suffield Memorandum No. 71/69
- e. DRB 652 dated 28 April 70

2. PURPOSE

The purpose of this series of trials is to determine the amount of 2,4-D (ester and amine) which is likely to drift from a typical ground application of the material under several weather and spraying conditions.

SCOPE

Trials 1-3 of this field experiment were conducted in July 1969. Continuation of the experiment will consist of a series of eight trials, four of which will be done with C<sup>14</sup> tagged material. Weather conditions typical of spraying operations on farm land will be sought. Measurements will be made of liquid, vapour and aerosol

Contributions from herbicide put on a layout of crosswind dimension 100 meters, downwind dimension 12.5 m. The desired ground coverage (sprayed material) is 4 g/m<sup>2</sup>.

4. SITE

Vertical Grid Layout.

5. WEATHER

- a. Wind direction - any
- b. Wind speed - 4-16 mph
- c. Air temperature - not higher than 95°F
- d. Precipitation - nil during period of each trial or in the 24 hours prior to each trial
- e. Stability - near neutral to moderate lapse.

6. TRIAL CONDITIONS

The trials will be conducted under the following circumstances:

<u>Trial No.</u>	<u>Material</u>	<u>Weather</u>
4	C <sup>14</sup> tagged 2,4-D ester	Windspeed 12-16 mph
5	Untagged 2,4-D ester	" "
6	C <sup>14</sup> tagged 2,4-D amine	Comparable to that for Trials 4 and 5 or Trial 1
7	Untagged 2,4-D amine	" "
8*	C <sup>14</sup> tagged 2,4-D ester or amine	Comparable to Trials 4 and 5
9*	Untagged 2,4-D ester or amine	" "
10	C <sup>14</sup> tagged 2,4-D ester or amine	Light wind, early evening
11	As required	Check trial

\* high volume, low pressure spray settings

7. MATERIAL

- a. 2,4-D butyl ester, tagged C<sup>14</sup> provided by Saskatchewan Research Council (SRC) (2.25 mCi per trial)
- b. 2,4-D amine, tagged C<sup>14</sup> provided by SRC (2.25 mCi per trial)
- c. 2,4-D butyl ester and amine untagged (provided by SRC)
- d. Agricultural boom sprayer (nozzles provided by SRC)
- e. Pie plates - 45
- f. Cascade impactors - 9
- g. Paper samplers (9 in x 6 in. photographic sheets on 18 inch square jump cards) - 15 required for trials with untagged material only (provided by SRC)
- h. Gasoline pumps - 42
- i. Airborne cloud samplers (provided by SRC but charged silica gel. DRES) - 145

8. LAYOUT

Figure 1 is a diagram of the trial layout.

9. PROCEDURES

- a. All samplers will be set out prior to zero at positions dictated by wind direction. Pie plates will contain silica gel.
- b. A meteorological OP will be set up in a position designated by the H/TSS.
- c. After ground samplers have been positioned, a trial run will be made by the boom sprayer crew to ensure their familiarity with the layout and to achieve the desired traverse speed. The apparatus will then be charged with the material to be sprayed in an area designated by the H/TSS.
- d. On instruction from the H/TSS, the layout will be sprayed a single pass. The start of the spray will be zero for the trial.
- e. Pie plates will be capped and picked up as soon as possible after the boom sprayer has completed its pass. Jump cards will be recovered immediately following this recovery.

f. Cascade impactors, operated at 17.5 l/min, will be placed at heights of 0.5 m at 3 positions 2 m from the downwind edge of the sprayed area and 0.5 m and 2 m at 3 positions 12 m downwind.

g. Airborne cloud samples will be taken at 1/2, 1, 2, 3, 5, and 9 m heights on the tower and the 30 m and 75 m circles, and at 0.3 m on the 75 m and 175 m circles. The downwind edge of the sprayed area will be 2 m from the upwind edge of the 75 m circle. The details of all sampler positions is given in Figure 1. The samplers will operate at 10 l/m.

10. SAMPLING SCHEDULE

<u>Circle (m)</u>	<u>Interval (min)</u>	<u>No. of Positions</u>
Tower	0-3, 3-30*	2
30	Total Dose	3
75	0-3, 3-30*	3
	Total Dose	4+13
175	Total Dose	13

\* Interval may be extended after Trial 4

11. METEOROLOGICAL OBSERVATIONS

The following meteorological information is required during each trial.

- a. Wind speeds at 1/2, 2 and 10 m
- b. Wind direction at 2 m
- c. Air and surface temperatures
- d. Temperature gradient 4m - 1/2m
- e. Relative humidity
- f. Cloud conditions and sunshine

ANALYSIS

For trials with C<sup>14</sup> tagged material, analyses will be done by liquid scintillation counting by Saskatchewan Research Council (SRC). Samples from trials with untagged material will be analyzed by a colorimetric procedure (for pie plates) and by gas liquid chromatography using an electron capture detector.

by SRC. Procedures for preparation, handling and disposition of samples will be issued separately. A few preliminary analyses will be done by DRES as required to assist SRC.

13. RADIATION SAFETY

a. It is expected that a total of 10 mCi of  $C^{14}$  tagged 2,4-D ester and amine will be shipped by SRC for storage at DRES prior to this series of trials. The amount of  $C^{14}$  to be used in any one trial is 2.25 mCi. On receipt from SRC, the tagged 2,4-D ester and 2,4-D amine will be kept in the Radioactive Storage Building. All mixing of these materials for spraying will be done at that location.

b. Film badges will be worn by all personnel engaged in the trials with radioactive material.

c. The vehicle used to transport tagged material from the mixing site to the layout will carry "Radioactive Material" signs front and rear and on both sides. The boom sprayer reservoir will carry a trifoil radiation warning sign.

d. The boom sprayer will be flushed three times with water and once with isopropyl alcohol following each spray run with tagged material. Unused residues from these trials will be collected on site in suitable containers which will be dumped in the Radioactive Disposal Area.

e. Room 222E, Central Laboratory, is designated as the area in which samples from trials with tagged materials will be handled. The room will be signed accordingly (medium level laboratory) and access to it will be restricted to personnel directly concerned with PE 593.

f. A post trial survey will be conducted to follow the decay of beta activity in the sprayed area. It is expected that this will not be measurable for more than 30 days.

14. ADMINISTRATION

H/Chem

Provide Radiation Safety Officer, Chemical test team, Co-ordinate sampling schedule and record sampling times. Prepare samples as required for dispatch to Canadian Dept. of Agriculture Laboratory, Regina, Saskatchewan. Provide film badges as required.



H/Tech S.

In charge of trial. Layout preparation. Record zero and spray run times. Provide spray apparatus. Sample of sprayed materials to Chem S. Mix 2,4-D ester and water as directed by SRC. Provide "Radioactive Material" signs for Munitions vehicle as required.

H/Met

Forecast and meteorological observations.

SRC

Provide 2,4-D ester and amine, both tagged and untagged; metal components for Gelman type samplers; paper; liquid scintillation counting vials. Assist in layout and sample preparation and provide all analyses required. Forward results of analyses to DRES as they become available.

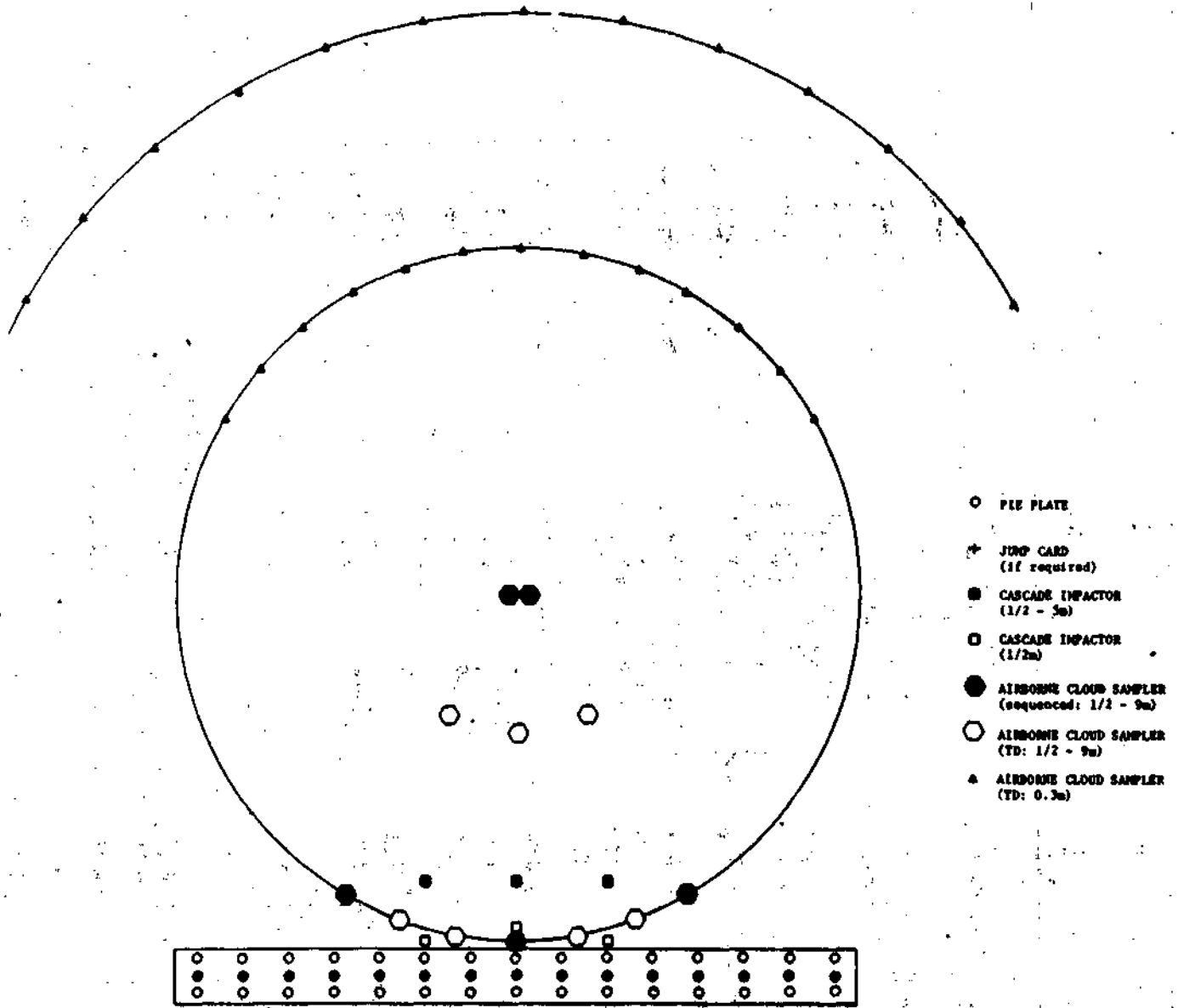


FIGURE 1