

IR-4 Advisory #2004-02 (Dec. 10, 2004)

Title: IR-4 Application Type Definitions

Issue/

Question: Can IR-4 definitions of application terminology be clarified so that the possible incidence of application calculation errors is reduced?

Background: Application terminology varies greatly between the three disciplines: entomology, plant pathology, and weed science. Because many IR-4 researchers conduct trials across these disciplines, and, because calculating an application rate is dependent on application type, unifying terminology is needed.

Application rates are usually expressed as a volume or weight of chemical applied to a unit area. Understanding the rate calculation methods can be confusing; some applications are intended to be applied only to a portion of the ground area of the plot, and others are applied to a three-dimensional space yet are still calculated as if applied to a two-dimensional area.

Resolution: IR-4 has chosen to define application types for uniformity across the three disciplines. These definitions have been distributed on occasion, most recently as an attachment to the 2001 San Antonio Results Document, which unfortunately contained some errors. This advisory is intended to provide easily accessible application type definitions for IR-4 Study Directors, Field Research Directors, Regional Field Coordinators, QA, and other data reviewers. The application type definitions on the following pages supersede previous IR-4 and discipline definitions.

If you have any questions, please contact your Regional/ARS Field Coordinator or the appropriate Study Director for further guidance.

IR-4 APPLICATION TYPE DEFINITIONS

I. **SOIL:** Any application that is made to the soil rather than to crop foliage or tree trunks. The intended targets are usually weeds, soil insects or soil-borne pathogens. Types of soil application include soil broadcast; banded, row middles, or the base of plants or trees; soil-directed; and seed furrow.

- Boom height for all soil applications is measured from nozzle tips to soil surface, or to the top of bed for raised beds.

All treated area sample calculations below are based on a plot with 10 rows on a 36 inch spacing (30 ft plot width) and 50 ft long (1,500 sq ft). The band width is 10 inches, where pertinent.

A. **SOIL BROADCAST:** *the uniform application of test substance across the plot to the soil surface.*

- Swath width: number of nozzles x nozzle spacing. For example: 4 nozzles at 18 inches = 6 ft swath width.
- Nozzle type: flat fan nozzles are recommended as they are designed to overlap.
- Sample calculation: Treated area = swath width x row length x number of passes
= 6 ft x 50 ft x 5 passes = 1,500 sq ft

Granular formulations are often applied as a soil broadcast (but without nozzles).

Several types of “NON-BROADCAST” soil applications may be made. Each of these consists of the uniform application of the test substance across a pre-determined portion of the row width. The differences between the three types listed below (B, C, and D) determine how the application rate is calculated.

B. **BANDED, ROW MIDDLES, OR BASE OF THE PLANTS:** *an application that is made over the crop row (banded), between individual crop rows or between multi-row beds or in wheel tracks (row middles), or at the base of orchard trees, plants, etc. The protocol will state the rate to be applied within the specified swath width. This rate should **NOT** be adjusted to reflect the actual row width.*

- Swath width: band width, measured at the target surface since the height of the nozzle influences the width.
- Nozzle type:
 - Banded: even fan nozzles, for their even spray pattern, if using a single nozzle per band.
 - Row Middles, Base of Plants/Trees: Wide angle even fan nozzles are suggested, if treated width can be covered with one nozzle; alternatively spray using a broadcast boom with flat fan (not even) nozzles. These applications are often performed with shielded or hooded sprayers to avoid contact with the crop.
- Sample calculation: Treated area = band width x number of rows x row length
= 10 inches (0.833 ft) x 10 rows x 50 ft = 416.7 sq ft

C. **SOIL DIRECTED, OR DIRECTED TO THE BASE OF PLANTS:** *the concentrated application of test substance (somewhat analogous to concentrated foliar directed applications) to the soil near the base of the crop. The intended targets are usually soil insects or pathogens.*

- Application rate is calculated using row width.
- Nozzle type: typically even fan nozzles for their even spray pattern.
- Sample calculation: If the rate is expressed as the amount of test substance per unit area, then the entire row width is used to calculate the amount of test substance needed. Treated area = row width x number of rows x row length
= 36 inches (3 ft) x 10 rows x 50 ft = 1500 sq ft

D. SEED FURROW: *sprays, drenches, or granular applications that are concentrated in the crop planting furrow. The intended targets are usually soil insects or pathogens. This application usually involves the application to the open furrow before the furrow is closed with soil. Row width may be used in application rate calculations, but typically the rate is expressed as maximum amount per linear foot of row (and many times maximum lbs ai/A).*

- Nozzle type: narrow angle flat fan tip or solid stream nozzles recommended.
- Sample calculation: If the rate is expressed as the amount of test substance per unit area, then the entire row width is used to calculate the amount of test substance needed. Treated area = row width x number of rows x row length
= 36 inches (3 ft) x 10 rows x 50 ft = 1500 sq ft

II. FOLIAR: Any application that is made to the crop foliage. The intended targets are usually insects, mites, or plant pathogens found on the foliage or fruits, or weeds growing in the crop; plant growth regulators may also be applied as foliar sprays. Foliar applications include airblast, foliar broadcast and foliar directed. When a protocol requires a foliar application without specifying broadcast or directed, the field cooperators may use their discretion to choose, based on their knowledge of the plant canopy and their application equipment capabilities. Thorough coverage of the foliage (and fruits, if present) is the desired result of the application.

A. AIRBLAST: *see Foliar Directed.*

B. FOLIAR BROADCAST: *the uniform application of the test substance across the plot to the crop canopy. Boom height for this application is measured from the nozzle tip to the top of the crop canopy (average height of crop canopy is used to account for the naturally occurring variability in plant height).*

- Swath width: number of nozzles x nozzle spacing. For example: 4 nozzles at 18 inches = 6 ft swath width.
- Nozzle type: flat fan nozzles are recommended as they are designed to overlap.
- Sample calculation: Treated area = Swath width x number of passes x row length
= 6 ft x 5 passes x 50 ft = 1500 sq ft

C. FOLIAR DIRECTED: *the concentrated application of test substance onto crop foliage within each row. The amount of test substance that is calculated to cover each entire row width is sprayed onto the crop. The fact that some ground between the crop rows may not be contacted by the spray is not factored into the rate calculations. Boom height and swath width are not calculated for foliar directed applications.*

- Application rate is calculated using row width.
- Nozzle type: typically hollow cone or even fan nozzles for even spray pattern (often disc type nozzles on airblast sprayers).
- Sample calculation: Treated area = row width x No. rows x row length
= 36 inches (3 ft) x 10 rows x 50 ft = 1500 sq ft

An exception to this is when rows in the research plot are wider than on typical commercial farms. For example, for a crop that is typically grown on 2-3 foot row widths, a research farm may have 4 foot rows to accommodate the equipment used at that site. Foliar directed sprays at this location should be calculated as if the rows were in the range of 2 to 3 feet wide. There are several methods of applying foliar directed sprays. For vegetables, the most common method is a boom sprayer with drop nozzles; i.e., one or more nozzles on each side of each row, facing in towards the foliage, and perhaps a single downward-facing nozzle directly above the crop. For small plants, a single nozzle directly above the crop (without drop nozzles on the sides) may be used to apply a foliar directed application. Hollow cone nozzles are recommended for these applications (though flat or even fan nozzles are acceptable). Foliar directed applications to bushes or trees may be made by airblast sprayer, spray gun, backpack sprayer with a single orifice, or backpack sprayer with a multi-nozzle straight boom held vertically (average distance from nozzles to the outside edge of plants is important).