

PESTICIDE RATE AND DOSAGE CALCULATIONS

Dan Horton, Extension Entomologist

HOW TO CALCULATE PESTICIDE DILUTIONS AND DOSAGES FOR LARGE AREAS

Pesticides for use in sprays are generally available as wettable or soluble powders and as liquid concentrates. These must be diluted, usually with water, before use. Other diluents, such as deodorized kerosene, may be used for special applications.

The precise amount of water applied to an acre (or other given area) is of modest concern as long as gallonage falls within a recommended range, delivers the recommended amount of pesticide, provides adequate coverage, and does not result in excessive runoff or drift. If you know the area (acres, sq. ft., etc.) or units (trees, cows, etc.) covered by a given amount of spray you can determine the dosage or rate of active ingredient each receives by adding the proper quantity of pesticide to that amount of water. Dusts and granules are applied without dilution by the user. Therefore the amount applied per acre or unit is much more critical because you have no other way of controlling the dosage or rate of active ingredient.

The amount of active ingredient in liquid concentrates is expressed in pounds per gallon. In granules, dusts, wettable or soluble powders, and other solids it is nearly always expressed as percent by weight. Application rates are usually expressed as amount of pesticide product but some- times they may be expressed as pounds of active ingredient or actual toxicant. Actual toxicant and active ingredient are practically synonymous.

1. To find the pounds of wettable powder (WP), dust (D) or granules (G) per acre to obtain the desired pounds of active ingredient (a.i.) per acre:

$$\text{lbs. of WP, D or G per acre} = \frac{\text{lbs. a.i. desired} \times 100}{\% \text{ a.i. in WP, D, or G}}$$

2. To find the pints of liquid concentrate per acre to obtain the desired pounds of active ingredient (a.i.) per acre: pints of liq.

**If you want the answer in gallons, quarts, or fluid ounces substitute 1, 4, or 128 respectively for 8.*

$$\text{conc. per acre} = \frac{\text{lbs. a.i. desired} \times 8^*}{\text{lbs. a.i. per gallon of liq. conc.}}$$

3. To find the amount of wettable powder (WP) or liquid concentrate to use in a given amount of spray:

amt. of WP or liq conc. = no. of acres treated with amount of spray X desired amount of WP or liq. conc. per acre*

**Trees, animal, etc. can be substituted for acres.*

4. To find the pounds of wettable powder needed to obtain a desired percentage of active ingredient in water:

$$\text{lbs. of WP} = \frac{\text{gals. of spray desired} \times \% \text{ a.i. desired} \times 8.3^{**}}{\% \text{ a.i. in WP}}$$

5. To find the gallons of liquid concentrate needed to obtain a desired percentage of active ingredient in water:

***One gallon of water weighs approximately 8.3 pounds. If another diluent is used the weight per gallon of the other diluent should be substituted for 8.3.*

$$\text{gal. of liq. conc.} = \frac{\text{gals. of spray desired} \times \% \text{ a.i. desired} \times 8.3^{**}}{\text{lbs. a.i. per gal. of liq. conc.} \times 100}$$

PESTICIDE RATE AND DOSAGE CALCULATIONS

PESTICIDE CONVERSION TABLE FOR LARGE AREAS

LIQUID FORMULATIONS

Amount of Commercial Product to Add to Spray Tank for Each Acre Treated

FORMULATION LBS./GAL. ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.															
	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1	1.1	1.5	2	2.5	3	4	6	9
1.5	10 oz	17 oz	26 oz	34 oz	43 oz	51 oz	64 oz	85 oz	96 oz	128 oz	171 oz	213 oz	256 oz	341 oz	512 oz	768 oz
2	8 oz	13 oz	19 oz	26 oz	32 oz	38 oz	48 oz	64 oz	72 oz	96 oz	128 oz	160 oz	192 oz	256 oz	384 oz	576 oz
3	5 oz	9 oz	13 oz	17 oz	21 oz	26 oz	32 oz	43 oz	48 oz	64 oz	85 oz	107 oz	128 oz	171 oz	256 oz	384 oz
4	4 oz	6 oz	10 oz	13 oz	16 oz	19 oz	24 oz	32 oz	36 oz	48 oz	64 oz	80 oz	96 oz	128 oz	192 oz	288 oz
6	2.6 oz	4.3 oz	6.4 oz	9 oz	11 oz	13 oz	16 oz	21 oz	24 oz	32 oz	43 oz	53 oz	64 oz	85 oz	128 oz	192 oz
6.7	2.3 oz	3.8 oz	5.7 oz	7.6 oz	9.6 oz	11.5 oz	14.3 oz	19.1 oz	21 oz	29 oz	38 oz	48 oz	57 oz	76 oz	115 oz	172 oz
7	2.2 oz	3.7 oz	5.5 oz	7.3 oz	9.1 oz	11 oz	13.7 oz	18 oz	20 oz	27 oz	37 oz	46 oz	55 oz	73 oz	110 oz	165 oz
8	2 oz	3.2 oz	4.8 oz	6.4 oz	8 oz	9.6 oz	12 oz	16 oz	18 oz	24 oz	32 oz	40 oz	48 oz	64 oz	96 oz	144 oz

WETTABLE POWDER FORMULATIONS

Pounds of Commercial Product to Add to Spray Tank for Each Acre Treated

% ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.																
	0.2	0.3	0.4	0.5	0.6	0.8	0.8	1	2	2	3	3	4	4	5	8	10
50	0.4	0.6	0.8	1	1.2	1.5	1.6	2	2	3	4	5	6	8	10	16	20
75	0.3	0.4	0.5	0.7	0.8	1	1.1	1.3	2	2	3	3	4	5.3	6.6	10.7	13.33
80	0.3	0.4	0.5	0.6	0.8	0.9	1	1.2	2	2	3	3	4	5	6.2	10	12.5

PESTICIDE RATE AND DOSAGE CALCULATIONS

PESTICIDE CONVERSION TABLE FOR LARGE AREAS (continued)

GRANULES AND DUSTS
Pounds of Commercial Product to Apply Per Acre

% ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.					
	1	2	3	4	5	10
2.5	40	80	120	160	200	400
5	20	40	60	80	100	200
10	10	20	30	40	50	100
15	6.6	13.3	20	26.6	33.3	66.6
20	5	10	15	20	25	50

CONVERSION TABLES FOR SMALL AREAS

LIQUID FORMULATIONS¹
Amount of Commercial Product to Add to Spray Tank to Treat 1000 Sq. Ft.

FORMULATION LBS./GAL. ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.							
	0.25	0.5	1	2	4	8	10	12
0.5	3 Tbs ¹ (43.4) ³	3 oz ² (86.8)	6 oz (173.7)	11 oz 1 Tbs (347.4)				
1	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	5 oz 1 Tbs (173.7)				
2	2 tsp (10.8)	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	5 oz 1 Tbs (173.7)	11 oz 1 Tbs (342.4)		
4	1 tsp (5.4)	2 tsp (10.8)	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	6 oz (173.7)	7 oz 2 tsp (217.1)	8 oz 4 tsp (260.6)

¹ approximate values

² refers to level measure

³ figure in parentheses refers to milliliters

PESTICIDE RATE AND DOSAGE CALCULATIONS

CONVERTING LARGE VOLUME RECOMMENDATIONS TO SMALL VOLUMES OR AREAS

Frequently, pesticide recommendations are given only for large volume applications, i.e. amount per 100 gallons or per acre, but only a small amount is needed. Conversion of liquids to smaller quantities is relatively easy and precise because suitable equipment such as measuring spoons are readily available. While scales sensitive enough to handle small quantities of solid materials are available, it is often more practical to use volumetric measures. Various conversion tables have been prepared on the premise that there are 200 to 300 teaspoons (roughly 2 to 3 pints) per pound of solid pesticide product. These tables are grossly inaccurate because of the wide variation in bulk density among solid pesticide formulations. For instance, a pint of almost any insecticide wettable powder will weigh much less than a pint of fungicide that has a high metal content. Greater accuracy can be obtained if one first determines the weight of a given volume of the solid material and then calculates the volumetric measure. This will usually provide acceptable accuracy but it is still not as accurate as actually weighing a solid formulation. When coupled with a little simple arithmetic the following formulas will enable you to convert large volume recommendations to smaller quantities.

1. To find the amount of liquid concentrate per gallon when label recommendations are given in pints per 100 gallons:
teaspoons/gallon = recommended pints per 100 gallons x 1*
or
teaspoons/gallon = recommended pints per 100 gallons x 0.96
or
milliliters/gallon = recommended pints per 100 gallons x 4.73*
2. To find the amount of wettable powder (WP) or other solid formulation per gallon when label recommendations are given as pounds per 100 gallons:
teaspoons/gallon = recommended lbs./ 100 gals. x cups in 1 lb. of formulation x 0.053*
or
teaspoons/gallon = recommended lbs./100 gals. x Tbs. in 1 ounce of formulation x 0.53*
or
grams/gallon = recommended lbs./100 gals x 4.54*
3. To find the amount of liquid concentrate to apply per 1,000 square feet when label recommendations are given as pints per acre:
teaspoons/1,000 sq. ft. = recommended pints/acre x 2.20*
or
milliliters/1,000 sq. ft. = recommended pints/acre x 10.9*
4. To find the amount of dust (D), granules (G) or wettable powder (WP) to apply per 1,000 square feet when label recommendations are given as pounds per acre:
lbs./1,000 sq. ft. = recommended lbs./acre x 0.023*
or
Tbs/1,000 sq. ft. = recommended lbs./acre x cups in 1 lb. of formulation x 0.37*
or
Tbs/1,000 sq. ft. = recommended lbs./acre x Tbs. in 1 lb. of formulation x 0.023*
or
grams/1,000 sq. ft. = recommended lbs./acre x 10.4*

*These values have been rounded off to facilitate calculations.