ENH90

UF UNIVERSITY of FLORIDA
IFAS Extension

Pesticide Calibration Formulas and Information[1]

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CALIBRATION FORMULAS

- **Acres Covered Per Hour**
- **Gallons Per Acre (GPA)**
- **Gallons Per 1000 Square Feet**
- **Ounces Per 1000 Square Feet**
- **Gallons Per Minute (GPM)**
- **Gallons Per Minute (GPM) Per Nozzle**
- **Minute Per Acre**
- **Minutes Per Load**
- **Travel Speed (Miles Per Hour, MPH)** (See Table 1)
- **Table 1.** Time (seconds) required to cover a specific distance to obtain a desired speed (mph).
- **Acres Covered Per Tank**
- **Material Needed Per Tank**
- **Flow Rate (As Influenced by Pressure)**
- For any change in travel speed (MPH), calculate the resulting GPA $_2$ by using:

$$\text{Acres Covered/Hour} = MPH \times Swath\ (ft) \times 0.1212 = \frac{MPH \times Swath\ (ft)}{8.25}$$

Acres Covered Per Hour.

$$\text{Gallons Per Acre (GPA)} = \frac{GPM \times 495}{MPH \times Swath\ (ft)} = \frac{GPM\ per\ nozzle \times 495}{MPH \times nozzle\ spacing\ (ft)} = \frac{GPM\ per\ nozzle \times 5940}{MPH \times nozzle\ spacing\ (inches)} = \frac{fl.oz.\ collected\ per\ nozzle \times 4084}{ft.\ traveled \times nozzle\ spacing\ (inches)} = \frac{fl.oz.\ collected\ per\ nozzle\ per\ 100\ ft \times 40.8375}{nozzle\ spacing\ (inches)} = \frac{gallons\ collected\ per\ nozzle \times no.\ of\ nozzles \times 43560}{ft.\ traveled \times Swath\ (ft)}$$

Gallons Per Acre (GPA).

$$\text{Gallons Per 1000 Square Feet} = 0.023 \times GPA$$

Gallons Per 1000 Square Feet.

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Ounces Per 1000 Square Feet

$$= 2.94 \times GPA$$

Ounces Per 1000 Square Feet.

Gallons Per Minute (GPM)

$$= \frac{GPA \times MPH \times Swath\ (ft)}{495}$$

$$= \frac{GPA \times MPS \times nozzle\ spacing\ (inches) \times no.\ of\ nozzles}{5940}$$

$$= \frac{fl.oz.\ per\ minute}{128}$$

Gallons Per Minute (GPM).

Gallon Per Minute (GPM) Per Nozzle

$$= \frac{GPA \times MPH \times nozzle\ spacing\ (inches)}{5940}$$

$$= \frac{GPA \times MPH \times nozzle\ spacing\ (ft)}{495}$$

$$= \frac{Test\ jar\ fl.oz. \times 0.46875}{seconds\ to\ fill\ test\ jar}$$

$$= \frac{7.5}{seconds\ to\ fill\ 1\ pint\ (16\ fl.oz.)}$$

$$= \frac{15}{seconds\ to\ fill\ 1\ quart\ (32\ fl.oz.)}$$

Gallons Per Minute (GPM) Per Nozzle.

Minutes Per Acre

$$= \frac{495}{MPH \times Swath\ (ft)}$$

Minute Per Acre.

Minutes Per Load

$$= \frac{gallons/load \times 495}{MPH \times GPA \times Swath\ (ft)}$$

Minutes Per Load.

Travel Speed (Miles Per Hour, MPH)

$$= \frac{Distance\ traveled\ (ft) \times 60}{time\ (seconds)\ to\ travel\ distance \times 88}$$

$$= \frac{Distance\ traveled\ (ft)}{travel\ time\ (sec) \times 0.68}$$

$$= \frac{GPM \times 495}{GPA \times Swath\ (ft)}$$

Travel Speed (Miles Per Hour, MPH).

Acres Covered Per Tank

$$= \frac{Gallons\ per\ tank}{GPA}$$

Acres Covered Per Tank.

$$= \frac{Rate/A \times gallons/tank}{GPA}$$

Material Needed Per Tank.

For any change in travel speed (MPH), calculate the resulting GPA_2 by using:

$$GPA_2 = \frac{GPA_1 \times MPH_1}{MPH_2} \quad or \quad \frac{GPA_1}{GPA_2} = \frac{MPH_2}{MPH_1} \quad or \quad MPH_2 = \frac{GPA_1 \times MPH_1}{GPA_2}$$

Flow Rate (As Influenced by Pressure).

For any change in travel speed (MPH), calculate the resulting GPA_2 by using:

$$GPA_2 = \frac{GPA_1 \times MPH_1}{MPH_2} \quad or \quad \frac{GPA_1}{GPA_2} = \frac{MPH_2}{MPH_1} \quad or \quad MPH_2 = \frac{GPA_1 \times MPH_1}{GPA_2}$$

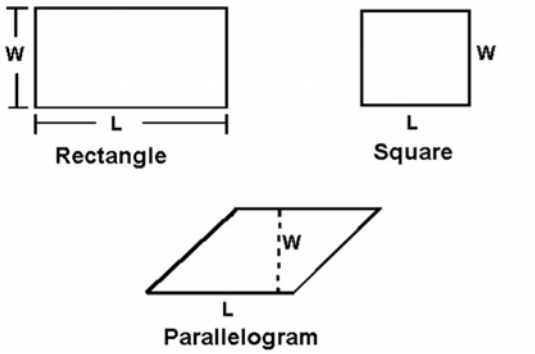
calculate the resulting GPA.

HELPFUL CALCULATIONS AND FORMULAS

- **Rectangle, Square, or Parallelogram**
- **Trapezoid**
- **Circle**
- **Sphere**
- **Triangle**
- **Cylinder**

Rectangle, Square or Parallelogram

$$area = length\ (L) \times width\ (W)$$



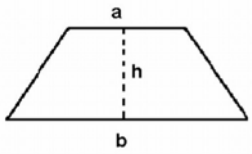
Rectangle, Square, or Parallelogram.

FINDING TANK CAPACITY (GALLONS)

- **Cylindrical Tanks**
- **Rectangular Tanks**
- **Elliptical Tanks**

Trapezoid

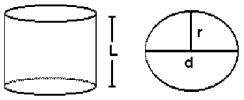
$$area = \frac{a + (b \times h)}{2}$$



Trapezoid.

Cylinder

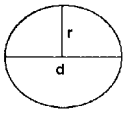
$$volume = radius\,(r)^2 \times 3.1416\,(\pi) \times length\,(L)$$



Cylinder.

Circle

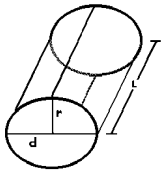
$$area = radius\,(r)^2 \times 3.1416\,(\pi)$$
$$= diameter\,(d)^2 \times 0.7854$$
$$radius = \frac{d}{2}$$
$$diameter = r \times 2$$
$$circumference = \pi \times d$$



Circle.

Cylindrical tanks

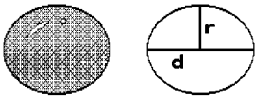
$$(inches) = L \times d^2 \times 0.0034$$
$$(feet) = L \times d^2 \times 5.875$$



Cylindrical Tanks.

Sphere

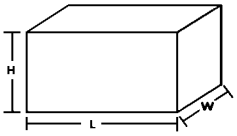
$$volume = radius\,(r)^3 \times 4.1888$$
$$= diameter\,(d)^3 \times 0.5236$$



Sphere.

Rectangular tanks

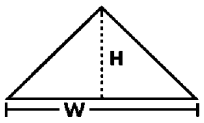
$$(inches) = L \times W \times height\,(H) \times 0.004329$$
$$(feet) = L \times W \times H \times 7.48$$



Rectangular Tanks.

Triangle

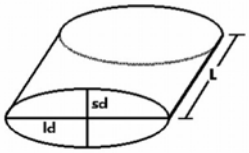
$$area = \frac{width\,(W) \times height\,(H)}{2}$$



Triangle.

Elliptical tanks

$$(inches) = L \times short\ diameter\,(sd) \times long\ diameter\,(ld) \times 0.0034$$
$$(feet) = L \times sd \times ld \times 5.875$$



Elliptical Tanks.

FLUID APPLICATION

- **Pounds Per Acre Nutrient Applied**
- **PPM (Parts Per Million)**
- **Pounds Active Ingredient (lb ai) to Use Per Tank**
- **Pounds (lb) Commercial Material to Use Per Tank**
- **Fluid Ounces (fl oz) to Use Per Tank**
- **Gallons (gal) Commercial Material for Total Treated Acres**

- **Table 2.** Approximate Rates of Application Equivalents.

Lbs/Acre Nutrient Applied

$$= 0.226464 \times \textit{element concentration (ppm)} \times \textit{acre-inches of solution applied}$$

Pounds Per Acre Nutrient Applied.

PPM (Parts Per Million)

$$= \frac{1{,}000{,}000 \times \textit{lbs ai used}}{\textit{gal/tank} \times 8.34}$$

$$= \frac{1{,}000{,}000 \times \textit{oz commercial material used} \times \textit{\% ai (decimal)}}{\textit{gal/tank} \times 8.34 \times 16}$$

$$= \frac{1{,}000{,}000 \times \textit{fl.oz. used} \times \textit{lb ai/gal}}{\textit{gal/tank} \times 8.34 \times 128}$$

PPM (Parts Per Million).

Pounds Active Ingredient (lb ai) to Use Per Tank

$$= \frac{\textit{PPM desired} \times \textit{gal/tank} \times 8.34}{1{,}000{,}000}$$

Pounds Active Ingredient (lb ai) to Use Per Tank.

Pounds (lb) Commercial Material to Use Per Tank

$$= \frac{\textit{PPM desired} \times \textit{gal/tank} \times 8.34}{1{,}000{,}000 \times \textit{\% ai (decimal)}}$$

Pounds (lb) Commercial Material to Use Per Tank.

Fluid Ounces (fl. oz.) to Use Per Tank

$$= \frac{\textit{PPM desired} \times \textit{gal/tank} \times 8.34 \times 128}{1{,}000{,}000 \times \textit{ai per gal}}$$

Fluid Ounces (fl oz) to Use Per Tank.

Gallons (gal.) Commercial Material for Total Treated Acres

$$= \frac{\textit{PPM desired} \times \textit{GPA acres} \times 8.34}{1{,}000{,}000 \times \textit{lb ai/gal}}$$

Gallons (gal) Commercial Material for Total Treated Acres.

PESTICIDE APPLICATION RECORD

Table 1. Time (seconds) required to cover a specific distance to obtain a desired speed (mph).

		Time required (seconds) to travel a distance of		
Desired MPH	Feet per minute	100 ft	200 ft	300 ft
2.0	176	34	68	102
2.5	220	27	54	81
3.0	264	23	45	68
3.5	308	20	39	58
4.0	352	17	43	51
4.5	395	15	30	45
5.0	440	14	27	41
6.0	528	--	23	34
7.0	616	--	19	29
8.0	704	--	17	26
9.0	792	--	15	23

Table 2. Approximate Rates of Application Equivalents.

Weights	Liquid
1 oz/ft^2 = 2722.5 lbs/A	1 oz/1000 ft^2 = 43.56 oz/A = 1.4 qt/A
1 oz/yd^2 = 302.5 lbs/A	1 pt/1000 ft^2 = 5.4 gal/A
1 oz/100 ft^2 = 27.2 lbs/A	100 gal/A = 2.3 gal/1000 ft^2 = 1 qt/100ft^2
1 oz/1000 ft^2 = 43.46 oz/A = 2.72 lbs/A	
1 lb/A = 1 oz/2733 ft^2 = 8.5 g/1000 ft^2	
100 lb/A = 2.5 lb/1000 ft^2	