

Improved Pesticide Rate Conversions

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One of the most difficult aspects of pesticide use in nursery crop production is the mathematical conversion of application rates to numbers appropriate for different-sized containers. This aspect is particularly serious with certain granular and solid formulations, since rate levels on pesticide labels are frequently given in terms of pounds per 1000 square feet or pounds per acre, and the grower must independently determine the exact amount to be applied per container. The situation is often exacerbated by the high toxicity of some granular compounds used in nursery production (Nelson, 1981) and the importance of following strict safety procedures to protect human health (Davies et al., 1983). While over-application can present an acute risk to humans and the environment, under-application results in lower efficacy.

The introduction of portable computers, calculators, and analytical equipment has enabled growers to use modern technology at the growing site to solve practical production problems and to facilitate management decisions (Fitzpatrick and Verkade, 1986, 1989).

Here we present a program developed for use on a relatively inexpensive, battery-powered programmable calculator that computes the number of grams of a solid formulation to be applied per container when rate is entered in pounds per square feet.

The program. This program is written in the RPN language and solves the following conversion equation:

$$n = \frac{N(453.9 \text{ g/lb}) \pi \left(\frac{d}{2}\right)^2}{D(144 \text{ in}^2/\text{ft}^2)},$$

where: n = number of grams per container, N = rate numerator in pounds, D = rate denominator in square feet, d = container diameter in inches.

This version will work without any modification on a Hewlett-Packard HP-1 IC calculator. With minor transcriptional changes, the program (Table 1) will also work on other calculators. (Versions written for the Hewlett-Packard HP-20C and HP-32S and Texas Instruments TI-66 and TI-68 are available from G.E.F. and S. D. V.) The program re-

quires that the user key in the rate numerator in pounds, the rate denominator in square feet, and the container diameter in inches. The program computes the container area and converts the rate into the number of grams appropriate for that container size.

A sample run. A grower wishes to apply Hopkins Snail and Slug Pellets to a crop growing in 10-inch-diameter containers (Table 2). The application rate on the label is 1 lb/1000 ft². The grower keys in the rate numerator, 1 lb, by entering 1, then keying in STO 1. Next, the rate denominator, 1000 ft², is keyed in by entering 1000, then STO 2. Finally, the container diameter, 10 inches, is keyed in by entering 10, then STO 3. The three input variables are now entered, and the program is executed by pressing the "f" key, then pressing the "A" key. The word "running" briefly appears on the display followed by the number 0.248. Each container should receive 0.248 g of this pesticide.

Application. Use of this program allows the rapid and precise determination of the exact amount of a granular formulation to be applied per container and eliminates the potential problems of over- or under-application. Once programmed, the calculator retains the program in its memory without affecting its normal functions; so, the calculator may be used for other purposes in the nursery.

Literature Cited

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Table 1. Program listing.

Keystroke	Display readout
f CLEAR PGRM	0.000
f LBL A	001- 42,21,11
RCL 2	002- 45 2
ENTER	003- 36
1	004- 1
4	005- 4
4.	006- 4
X	007- 20
STO 5	008- 44 5
RCL 3	009- 45 3
ENTER	010- 36
2	011- 2
÷	012- 10
ENTER	013- 36
g X ²	014- 43 11
f π	015- 42 16
X	016- 20
STO 4	017- 44 4
RCL 1	018- 45 1
4	019- 4
5	020- 5
3	021- 3
.	022- 48
9	023- 9
X	024- 20
STO 9	025- 44 9
RCL 9	026- 45 9
ENTER	027- 36
RCL 4	028- 45 4
X	029- 20
RCL 5	030- 45 5
÷	031- 10
g RTN	032- 43 32

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Table 2. Operating directions and program listing for converting pesticide rate levels from weight per dunit area to weight per container.

Step	Instructions	Input data	Keystrokes	Output data
1	If the calculator has been programmed, go to step 4. If not, switch into program mode.		g P/R	
2	Key in the program (lines 001-032, Table 1)			
3	Switch calculator into run mode		g P/R	
4	Key in the rate numerator, in pounds	N	STO 1	
5	Key in the rate denominator, in square feet	D	STO 2	
6	Key in the diameter of the container, in inches	d	STO 3	
7	Execute the program		f A	Amount of pesticide to be applied per container, in grams
8	If other pesticide conversions are needed, return to step 4. Entry of new data will automatically clear the storage registers in the calculator			

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