GROWERTALKS

Columns

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Injector Basics: Ratios & Recipes

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Growers rely on injectors to deliver nutrients and chemicals in the concentration intended. Fortunately, today's injectors provide many years of reliable service with only a small amount of maintenance. You wouldn't think of skipping injector maintenance, but have you considered periodic staff training, too? As wonderful as injectors are, they only do what we tell them to do. A slight miscalculation can mean a large over- or under-application of product, which can have rapid or elusively slow negative effects on crops and budgets. With the busy season at hand, it's worth taking a few minutes to review injector use and stock-tank preparation with your team.

Understanding injector settings

First, ensure that all staff members using injectors understand the basics of setting the injector and what the numbers mean. The most important thing to understand is that the numbers printed on the stem of the injector represent injection ratios, not ppm of solution delivered (see photos). An injector set at 1:100 injects one part stock solution into 100 parts water, resulting in a 1% solution. An injector set at 1:200 injects one part stock into 200 parts water, creating a more diluted solution from the same stock tank. Injector settings can be shown as percent or ratios. The table below lists injector percent and comparable ratio.

Comparable injector settings

Injector Percent	Injector Ratio
2.0%	1:50
1.0%	1:100
0.78%	1:128
0.5%	1:200

Injectors are most commonly set at 1:100, or 1%, simply because most product use rates are provided in terms of 100 gal. Therefore, use of a 1-gal. stock solution containing the amount defined per 100 gal. will generate a final solution of the correct concentration. For nearly all non-fertilizer applications, using the 1:100 setting will greatly simplify calculations and reduce errors. When applying fertilizers, altering the injection ratio on the fly allows for application of variable fertilizer rates to different crops without the need to prepare multiple stock solutions. Still, most growers set their injectors to 1:100 and seldom change the setting.

Calculating stock tank recipes

Understanding the injection ratio leaves just one more step to get the right concentration of product applied to the crop: creating the stock solution. For products with rates defined per 100 gal., such as acid, chemigation-labeled fungicides and chemigation-labeled plant growth regulators, stock solutions are simply calculated by multiplying the per-100-gal. amount by the volume (in gallons) of the stock needed. For example:

Product rate for a fungicide drench application is 2.5 oz./100 gal. Five-hundred gallons of solution are needed and the injector is set at 1:100. How much product is needed?

1: Divide the total gallons desired by the injection ratio: 500/100 = 5 gal. stock needed.

2: Multiply the value from Step 1 by the rate: 5 x 2.5 = 12.5 oz. of product required.

3: Prepare a 5-gal. stock solution containing 12.5 oz. of fungicide and apply through the injector set at 1:100.

Calculations for fertilizer stock tanks require just a few more steps and a little understanding of fertilizer basics. Fertilizer rates, such as 200 ppm, generally refer to the concentration of nitrogen supplied, so calculations are based on the first number in the N-P-K formulation. Knowing the injector setting and percent of nitrogen (N) in the fertilizer will allow for calculation of a stock tank recipe. It's important to remember that stock recipes aren't interchangeable between fertilizer formulations with different N values.

The table below lists amounts of fertilizer to be added to a stock tank to generate a 100 ppm solution under various injector settings for fertilizers with 19% and 20% N. Note that the values differ for formulations with 19% N compared to 20% N. Product-specific information is often printed on fertilizer packaging. Using this information, a fertilizer stock recipe can be calculated. For example:

Ounces of fertilizer to be added per gallon of stock for listed injector settings to provide 100 ppm N

	Injector Settings		
Percent N	1:100	1:128	1:200
19	7.1	9.1	14.2
20	6.8	8.6	13.5

A 5-gal. stock tank will be used to apply 200 ppm N of 20-10-20 with an injection ratio of 1:100. How much fertilizer should go into the stock tank?

1: The 20-10-20 formulation is composed of 20% N. Referring to the table, see the row for Percent N = 20. The value for 1:100 injection is 6.8.

2: Adjust for the desired 200-ppm rate, dividing the desired rate by 100: 200/100 = 2.

3: Multiply the value from Step 1 by the value from Step 2: 6.8 x 2 = 13.6 oz. fertilizer.

4: Multiple the value from Step 3 by the volume of the stock tank: 13.6 x 5 = 68 oz. fertilizer.

5: Add 68 oz. (4.25 lb.) of 20-10-20 fertilizer per 5-gal. stock tank and inject at 1:100 to apply 200 ppm N.

A little staff training can go a long way towards preventing an injection error. An informed team is one that can spot and correct problems, making for a more successful season. **GT**

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