e-GRO Alert
Volume 6, Number 18 March 2017

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Improving Plant Growth Regulator Spray Applications

Treating containerized crops with plant growth retardants (PGRs) is one of the best ways to manage plant size and turn a good crop into a great one. However, spray uniformity and the growth control can be variable and less than we'd like. This e-GRO Alert will focus on a few ways you can improve your PGR spray applications.

Plant growth retardants are a tool we frequently use to improve the aesthetic quality of plants, increase plant density in the greenhouse and on shipping racks, and reduce water and fertilizer use. There are several ways PGRs are applied to floriculture crops, including substrate drenches, plug and liner dips, bulb soaks, and- the most ubiquitous method- foliar sprays. While each of these methods have are effective and have a place in greenhouse production, foliar sprays are the most common application method due to their ease of use and familiarity. However, unlike some of the other techniques, foliar sprays can result in uneven growth control (Figure 1). In order to get the most uniform coverage and subsequent growth control, the correct amount of solution needs to be applied with properly functioning and calibrated equipment with experienced personnel.

Figure 1. These mixed containers were grown in the same block of plants. While they were supposed to have been treated with the same plant growth retardant application, the container on the left did not receive the same treatment as the one on the right.

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Application volume

An important factor in achieving appropriate and uniform growth control is applying the correct amount of solution (Figure 2). A very traditional recommendation has been to apply PGR solutions to "runoff". Well, what does that mean? Most think of "runoff" as the point when PGR solution is running off the leaf. But what is runoff? A small droplet running off a leaf margin? Or is it a steady stream of solution coming off of the leaf tip? The challenge with using a benchmark such as "runoff" is that it can be perceived differently by different applicators. As such, a

Figure 2. Was enough solution applied? With geraniums, growers can look for the classic "halo" or marginal chlorosis resulting from chlormequat chloride foliar sprays to indicate that sufficient growth retardant was applied. This is a transient phytotoxic response.

better approach is to apply a known volume of solution over a fixed area for PGR spray applications. The most common recommendation is to apply 2 quarts of solution per 100 ft^2. This removes the subjective benchmark of "runoff". While 2 quarts per 100 ft^2 is the standard application volume for sprays, there are instances where smaller or larger volumes can be appropriate. For example, if you want to minimize spray solution coming into contact with the substrate or running down stems, you may want to use 1 quart per 100 ft^2. Alternatively, if canopies are large and dense and you want solution to contact the stem you may increase solution volumes to 3 quarts per 100 ft^2.

Equipment maintenance

Another important factor in getting uniform PGR applications is to keep application equipment in good working order and calibrated. Whether you are applying your sprays with a hand-held applicator, boom, or other

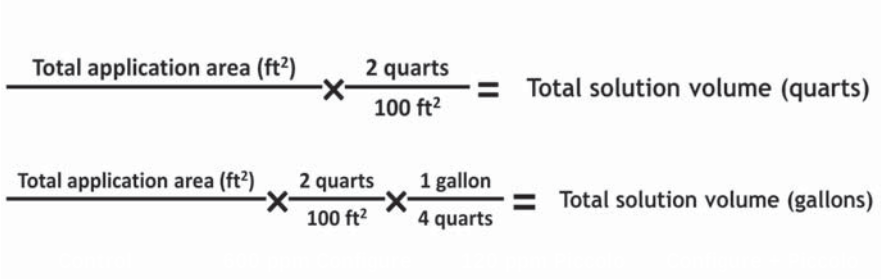

Figure 3. These formulas can be used to determine the total amount of solution required to cover a given area in quarts (top) or gallons (bottom). This example uses the standard volume of 2 quarts per 100 ft²; to use a different solution volume, adjust the volume per 100 ft².

spray equipment, keeping nozzles clean and free of debris will improve your application uniformity. If nozzles are blocked with debris they can reduce uniformity in a few different ways. First, if nozzles are clogged they can reduce or completely block solution from being sprayed. This would be obvious with a hand-held sprayer with a single nozzle. However, this may be more easily overlooked or missed when applying solutions through booms with numerous nozzles. Though some solution from adjacent nozzles may cover plants placed beneath blocked nozzles, the total solution applied to crops immediately below and result in sub-optimal control. If nozzles are partially clogged, this may cause solution to drip or stream out of the nozzle instead of a fine spray. This can also diminish coverage and uniformity. For PGRs that are absorbed by the roots, plants underneath the clogged nozzle may be overregulated, as a larger volume of solution will be applied to the substrate; this would not be the case for PGRs that lack root uptake, like daminozide.

Personnel

The people applying your PGR sprays are going to be your key to consistency. Whether it is calculating how much solution

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or active ingredient is required to actually handling spray equipment, people are key to consistency. It starts with calculating the right amount of solution you will need for your application. As previously discussed, this is usually 2 quarts per 100 ft^2. Using your desired application volume, you then need to know the total amount of bench or floor space you'll be treating or the number of containers and the spacing they are on. Use the equations in Figure 3 to determine your total solution volume in quarts or gallons.

The next calculation is to determine how much active ingredient you will need to add to reach your target concentration. This is where the old axiom from carpentry- "measure twice, cut once"- comes into play; however, for PGRs it is more like "calculate amounts twice, measure and add active ingredient once"! A decimal placed one place off to the right or the left can have a dramatic effect on your crop- either over- or under-regulating growth. The PGR Mixmaster app (e-gro.org/mixmaster) can help you calculate how much active ingredient to add (in fluid ounces) and water (in gallons), you just need to select the active ingredient and know your final solution volume.

Finally, and most importantly for hand-held spray applications, is to have a properly calibrated application technique. In addition to having equipment that is functioning properly, applicators need to ensure that they are applying solutions to achieve their target volume over their desired treatment area in a uniform fashion.

Take-home messages

Foliar sprays are the most common way to apply PGRs. It is a familiar technique that we use for other chemical applications in the greenhouse. However, sprays also present several opportunities for variability in the uniformity of application. Having trained and experienced personnel mix and apply the appropriate volume of solution with properly calibrated and functioning equipment can help you get achieve uniform results.