e-GRO Edible Alert

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It Figures: Calculating Application Rates for Greenhouse Vegetable Crops

One of the more challenging questions I receive concerns determining insecticide or miticide application rates for edible greenhouse crops. Really?! Why is there an issue when rates are clearly specified on the label? The problem is that such labels for vegetable crops often specify a particular amount of product per acre, but growers want to know how much product to mix into 10 or 100 gallons of water. Translating from one to the other – there's the rub. Too little may not work. Too much risks plant injury, exceeding maximum use rates and possibly illegal residues, to say nothing of the unnecessary expense. It might help to review some recent examples drawn from our own experiences with products labeled for use on greenhouse fruiting vegetables.

We have been conducting a trial comparing various experimental treatments including Admire Pro as a foliar spray for managing aphids on greenhouse eggplants. This is a very small-scale study with only eight plants in each treatment. All the products specify application amounts on a per-acre basis; our plants were spaced (in pots) in an arrangement comparable to a production range and we measured the area covered. With the square footage we could easily calculate the amount of insecticide needed (1 acre = 43,560 square feet). We then got out the sprayer and did a test (repeated 3x to get an average) to see how much water we'd use for plants in that same area. So now we know how much Admire Pro to add to a given quantity of water to do the job on that day. Of course, with plants still growing rapidly the gallonage keeps changing, so the following week we re-checked and found more water was needed to get satisfactory wetting.

Shuttle O is a slightly different case. The label has a specific rate of Shuttle O to apply per acre – easily calculated as before – but also notes not to apply in less than 100 gallons of water volume per acre for each application. Usually that gallonage is easily exceeded for older crops with most hydraulic sprays, but some nozzles or equipment might not reach that goal and especially if plants are small, which is clearly intended to assure good coverage (and performance) with a material that mainly works on contact. With some equipment the applicator may need to adjust pressure, speed of application, and/or the nozzle size to meet this requirement.

A third example provides another contrast. The Pylon label provides a range of rates for target pests on fruiting vegetables – easily calculated for our situation like in the Admire example – but also requires the application be made in a volume between 5 and 100 gallons per acre. When conducting our small-scale test with our sprayer the initial setup exceeded this amount of water per acre by a wide margin. Our solution was to install a nozzle with a very small orifice. This adjustment was sufficient to get us under the 100 gallons per acre maximum. We also could have reduced the operating pressure to further lower the output if needed. We checked the deposition on foliage and determined the coverage was adequate. In other lower-volume applications including an adjuvant to spread out the droplets may be helpful, but in this case Pylon labels specifically note adding adjuvants is unnecessary and some may enhance likelihood of plant injury (excess wetting agents can also lead to unacceptable runoff). Given Pylon's translaminar activity extremely thorough coverage also isn't quite so critical.

Accurate calibration is especially important in heavy infestations to avoid poor control, plant damage or excess residues on fruit

When controlling aphids, good coverage under leaves is important when using materials with contact activity.

Swapping out nozzles is one simple way to adjust gallonage when making spray applications.

Check spray pressure when making applications. Changing pressure is another way to modify spray volume and possibly improve coverage as well.

Directing spray to leaf undersides is important for targeting pests like spider mites and aphids especially when using materials that work mainly on contact.

For small-scale growers (like us) another issue concerns measuring out very small quantities in fractional numbers, so we use pipettes or scales and generally convert amounts to metric, and then measure out in milliliters or grams rather than ounces (e.g. 0.07 fluid ounces is approximately 2 milliliters, 0.14 dry ounces is approximately 4 grams). Figures are easily converted using internet websites or hand calculators. In making any of these applications we're careful to note maximum amounts and seasonal or crop totals applied in a certain area. We also want to be sure the application is not overly dilute (labels also sometimes prohibit low-volume application), so I sometimes verify in other ways that we're not using an excessive amount of water (that's another discussion). We try to avoid all runoff, generally spraying just to wet or to point of drip depending upon the material. We're generally using a single nozzle that enables good coverage as it can be continually redirected to cover tops and undersides of leaves as well as terminals while maintaining a reasonable distance from foliage. Good coverage is important for trials evaluating efficacy, but production operations also place a high value on speed. In such cases the type of product and how it works will help guide how the application needs to be done and adjustments to make. Remember that swapping nozzle types for smaller or larger orifices, raising or lowering sprayer pressure and possibly even application speed are just some of the adjustments that might be made depending upon the product used. Particularly with materials that work mainly on contact, including most organic-compatible products, good coverage should be a high priority for best results.

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