FEEDING YOUR ORCHIDS - *REVISITED*

Third in a series

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When we last looked at the nutrients that orchid growers use to nourish their orchids, the series stalled for lack of feedback. However, to continue we will again visit the concept of parts per million and how one might calculate it from the listed components on your fertilizer container. And touch on nutrient strengths for our solution making.

Why is it imperative to have some idea of the solution strength involved in mixing fertilizer with water? Simply stated, the reason is two-fold:

(1) If the amount of fertilizer added makes the solution stronger than is desirable, the plant suffers from dessication, the roots get burned, etc.

(2) If the solution is too weak, the plant suffers from lack of nutrients needed for growth and flowering.

Because we Texans (actually most citizens of the USA) use a system of volumes and weights that are not directly related to each other. A cup of sugar has one weight, while a cup of water is different. Because there is no direct ratio involved, we end up using various conversion factors to establish solution strengths. So let's look at what the concept of parts per million means, where it came from, and how we can use it.

In the metric system, a liter of water (volume) weighs one kilogram (weight), so 1/1000 of a liter is a milliliter that weighs one milligram.

If a gram of a substance is dissolved in exactly 999 milliliters of water, the mixture weighs 1000 grams. The dissolved substance is in solution with a strength of 1000 parts per million, also known as "ppm."

Orchids in natural sites receive very dilute solutions of dissolved nutrients. Ed Wright has indicated that the values may be as low as 15 ppm, on a continuing basis, with an occasional blip higher when a friendly bird makes a deposit close to the plant. (1)

However, if we were to give such low amounts of nutrients, and missed a few feedings, the plant growth may be stunted, or is not optimized. Many growers utilize fertilizer and water mixture which contain 100 to 200 ppm of nitrogen, along with the phosphorus and potassium portions. Ask Bill Tippit of Olympic Orchids, who has managed to have phals grow from seed to flowering in as little as 18 months. (2)

On looking for information on paphs, the folks at AnTec Laboratory have ublished recommendations for a range of 60 to 100 ppm of nitrogen, 60 to 100 ppm of potassium and 30 to 50 ppm of phosphorus. (3)

But we folks use stuff like teaspoons, cups, gallons and so on to measure things. Seldom do food recipes call for items by weight, unless it is the amount of steak we would grab at the grocery store. But we are talking of important things when we are feeding our orchids. Like on to how to calculate ppm using OUR system of measurements.

Our ounce of weight contains 28.35 gram. A gallon of water weighs about 8.345 pounds,(unless it sits in the hot sunshine too long, then it's gone, evaporated). Playing with all of that gives us some ratios to use.

Start with a gram dissolved in one gallon of pure water, or an ounce dissolved in 28.4 gallons, or 3.52 ounces in 100 gallons, and so on...

Each one of these mixtures would have the same solution strength with 264 ppm. Now we can look at the chemical compounds in our fertilizer to determine how much nitrogen, phosphorus and potassium is in the amount we would spoon into a gallon.

Fertilizer packaging has labels with percentages of these three basic nutrients, but look closer. The first percentage number applies to nitrogen and indicates the actual percentage by weight. Phosphorus must be shown as P_2O_5 and potassium as K_2O.

The P portion of P_2O_5 is about **44%** , while the K part of K_2 O.is about **83%** . Those are important percentages that we'll use on down the line to determine how much of a given fertilizer must be used to get a specific solution strength.

Soluable fertilizers come in various packages with different weights. However, even if you have no scale to accurately measure a small weight, such as an ounce or a gram, you can still get an accurate weight to volume ratio. If the package weighs a pound, and the volume is two cups, the 32 ounces of fertilizer occupies 96 level teaspoon measurements. That's 1/3 of an ounce per teaspoon. So then, 1/3 of 28.35 grams is in a teaspoon = 9.45 grams per teaspoon.

If the volume of a half pound of a fertilizer doesn't make exactly 1 cup, then the best determination is to measure the entire half pound by tablespoons, then divide the 8 ounces by the number of level tablespoons to get the weight per spoon.

Either way, one can establish the amount by volume of a given number of grams. Once you know that, you can get very close to a desired ppm of a nutrient by adjusting that a gram per gallon makes up 264 ppm of the total dissolved fertilizer. The same ratio is constant for the following amounts:

1 gram per gallon,

1 ounce per 28.35 gallons,

3.51 ounces/100 gallons

7.05 ounces per 200 gallons

1 pound per 453.6 gallons

17.6 oounces per 500 gallons

Using that table of measures and ratios, one can then calculate the ppm of a nutrient with this table:

Percent	ppm	ppm	ppm
N, P or K	N	P	K
1%	2.64	1.16	2.19
2%	5.28	2.32,	4.38
3%	7.92	3.49,	6.57
4%	10.56	4.65,	8.76
5%	13.2	5.81,	10.96
6%	15.84	6.97	13.15
7%,	18.48	8.13	15.34
8%,	21.12	9.29	17.53
9%	23.76	10.45	19.72
10%	26.4	11.62	21.91
20%	52.8	23.23	43.82
30%	79.2	34.85	65.74
40%	105.6	46.46	87.65
50%	132.0	58.1	109.56

If you are using a 10-10-10 fertilizer, obviously read straight across the table for 26.4 ppm N, 11.62 ppm P and 21.91 ppm K. If you needed 100 ppm N, divide 100 by 26.4 to establish the multiplier on your spoonage figure. **Just make sure all three major elements plus the other stuff in the fertilizer are not too strong**.

In Houston, where water can easily contain 150 to 200 ppm of dissolved calcium compounds, the upper limit for non-RO water out of a faucet would be around 450 ppm of dissolved fertilizer, so the guideline there is to use a multiplier of 1.7 or so. Otherwise, roots and leaves will quickly indicate over-mineralization in your mixture.

References:

(1) Ed Wright, OrchidSafari discussion

(2) Bill Tippitt, personal communication

(3) Bill & Lynn Wellenstein, AnTec Labs, "Mineral Nutrition for Slipper Orchid Growers"