

## How Much P is There?



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*Phosphorus is a commonly overlooked element when designing a fertilizer plan. However, phosphorus can yield a significant impact on plant growth and form, depending on the P fertility rate.*

Phosphorus (P) fertility rate is a commonly overlooked part of a fertility program. Phosphorus can directly influence plant internode length, plant vigor, and root development. In greenhouse production, phosphorus is often supplied early to promote plant establishment and encourage vigor in young plants. However, excessive P throughout production can lead to unintended impacts on plant growth and development, including excessive plant stretch, potential nutrient antagonism, or nutrient runoff.

Low phosphorus fertility can result in deficiency symptoms, including stunting, reddening, or purpling of the lower foliage (Fig. 1).

Additionally, olive green spotting can occur as another deficiency symptom, especially in warmer

growing conditions (Fig. 2). While P toxicity is not reported for many species, nutrient imbalances can result in nutrient antagonism between P and iron (Fe) at high concentrations, especially for Australian natives such as scaevola (Fig. 3), however, a more common concern is internode elongation (Fig. 4).

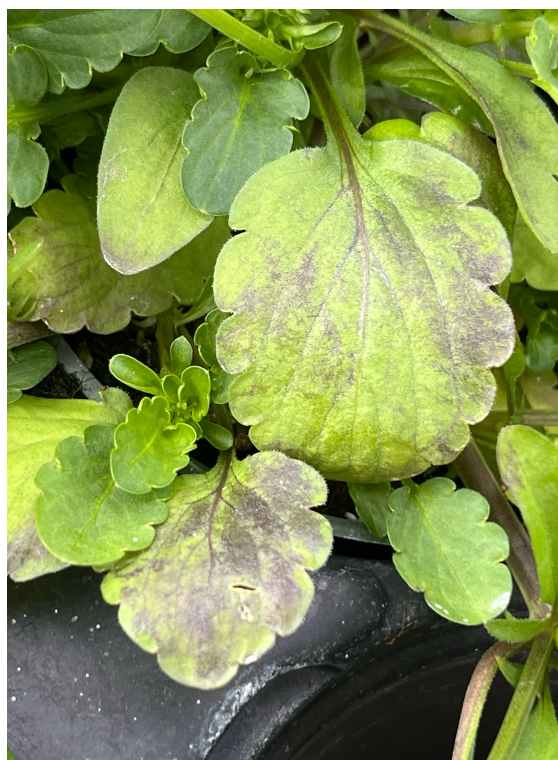


Figure 1. Phosphorus deficiency symptoms include stunting and reddening or purpling of lower foliage. (© Patrick Veazie)

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### What Does the Label Mean?

Fertilizer labels provide three numbers on a bag representing the percentage of nitrogen (N), phosphorus ( $P_2O_5$ ), and potassium ( $K_2O$ ). These values indicate the relative nutrient content, helping growers match fertilizer choices to crop needs and production goals. While fertilizer labels list phosphorus as %  $P_2O_5$ , plants take up phosphorus as ppm P, not  $P_2O_5$ . To convert  $P_2O_5$  to elemental P, multiply the listed percentage by 0.437; for example, 10%  $P_2O_5$  delivers 4.37% P. This difference is important when utilizing fertility recommendations based on ppm P. Without conversion, growers may unintentionally overapply phosphorus, leading to excessive growth, runoff risk, or nutrient imbalances.

### How Much Phosphorus is Needed?

The required P fertility rate is very low compared to other essential macro elements. While nitrogen fertility rate is generally recommended between 100-200 ppm N, P fertility rates can be as low as 5-10 ppm P while still achieving optimal plant growth (Fig. 5). Previous work by Dr. Josh Henry (currently a Ball Seed Technical Services Specialist) determined that low P fertility of 5 to 10 ppm P for most crops and 10-20 ppm P for heavy-feeding crops is optimal to provide sufficient fertility and limit excessive plant stretch. Additionally, this suggests that many common fertilizers, such as 20-20-20 or 20-10-20, can supply in excess of 10 times more phosphorus than necessary or recommended.

### Phosphorus Leading to Stretch

In many floriculture crops, phosphorus availability influences shoot elongation, particularly during the early vegetative phase. High P concentration, when paired with high nitrogen (N) specifically ammoniacal-N, can promote rapid cell expansion and increased internode length. This is often observed in crops like petunia, calibrachoa, and geranium, where limiting internode stretch is an important factor when developing a high-quality plant. While P is essential for root initiation and cell metabolism, excessive availability can shift



Figure 2. Olive-green spotting on leaves can appear under warm conditions as another sign of low phosphorus. (© Brian Whipker)



Figure 3. Excessive phosphorus applications can inhibit the uptake of iron in phosphorus-sensitive Australian natives such as scaevola. (© Brian Whipker)



Figure 4. High phosphorus availability promotes internode elongation and can disrupt compact growth in floriculture crops. (© Brian Whipker)

balances and drives unwanted stretch. However, deficient P concentration can delay rooting and reduce early vigor. The goal is to apply enough P to support establishment without overshooting the crop's actual demand.

**How Do Common Fertilizers Compare?**

When fertility programs are designed around ppm N, the amount of P supplied will vary depending on both the nitrogen percentage and the P<sub>2</sub>O<sub>5</sub> content of the blend. The table below illustrates how several common formulations deliver phosphorus across a range of nitrogen application rates (75–250 ppm N) (Table 1). This comparison highlights how quickly P delivery can exceed recommended levels, even when nitrogen is applied within typical greenhouse ranges.

**Conclusion**

Understanding how much elemental phosphorus your fertilizer delivers is essential for managing early growth and internode length in floriculture crops. While high-P fertilizers may be appropriate for rooting cuttings or correcting deficiencies, routine use during vegetative production can lead to excessive elongation and unnecessary nutrient loading. By calculating ppm P at your target N rate, you can better align fertility with crop needs—supporting compact, marketable growth without overapplying a nutrient that's easy to overdo.



Figure 5. Moderating the phosphorus fertilization rate can be used to manage plant growth (left to right: 2.5, 5, and 10 ppm P). (© Brian Whipker)

Table 1. Phosphorus delivery for common fertilizers when applied at 75 to 200 ppm nitrogen (N).				
Fertilizer	N Fertility Rate (ppm)			
	75	100	150	200
Corresponding Delivered P Rate (ppm)				
10-30-20	98.34	131.10	196.68	262.20
20-20-20	32.78	43.70	65.55	87.40
20-10-20	16.39	21.85	32.78	43.70
15-15-15	32.78	43.70	65.55	87.40
15-5-15	5.37	9.55	21.48	38.19
17-5-17	9.64	12.85	19.28	25.71
13-2-13	5.04	6.72	10.08	13.45

*Classifications: Recommended (<15 ppm P), Elevated (15-20 ppm P), High (20-30 ppm P), Very High (30-50 ppm P), Excessive (50-100 ppm P), and Toxic (>100 ppm P).*

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