

PSES 3411 Quiz 11 Key

Chlorosis is a common deficiency symptom in plants.

What is chlorosis? (3 points)

Chlorosis is a yellowing of plant tissues, most commonly, the leaves. Chlorosis may take many forms, from yellowing of the whole plant, to yellowing of older tissues, to yellowing of newer tissues, to yellowing between the veins of the leaves.

Necrosis, death of plant tissues, may follow severe chlorosis.

What does chlorosis tell you? (3 points).

Chlorosis is a symptom that the plant is experiencing stress, much as a fever is a symptom that your body is stressed. The source of the stress is unknown without further diagnostics. These diagnostics include observing the pattern of chlorosis on the plant, examining the plant for evidence of insects or diseases. Further, tissue testing is an option to identify if the nutrient balance in the plant tissues is correct.

How much 10-20-0 would you add to get 40 pounds of N per acre? (3 points)

The grade of this fertilizer is 10-20-0, which means it has 10% N (elemental basis), 20% phosphate (phosphorus pentoxide, P_2O_5), and 0% potash (dipotassium oxide, K_2O). This labeling is misleading, because there is no P_2O_5 or K_2O in the fertilizer. The phosphate is present as a simple phosphate or orthophosphate ($H_2PO_4^-$, HPO_4^{2-} , or PO_4^{3-}), while the potassium is present as a simple cation (K^+).

Set up the appropriate ratio needed to find the answer in the desired units. Notice this ratio is a dividend of fractions. When dividing fractions, invert the denominator and multiply.

$$\frac{\frac{40 \text{ lbs } N}{ac}}{\frac{10\% N}{10-20-0}}$$

Notice the N is present in both the numerator and denominator, so it cancels.

$$\frac{\frac{40 \text{ lbs } N}{ac}}{\frac{10\% N}{10-20-0}} = \frac{40 \text{ lbs } N}{ac} \times \frac{10-20-0}{0.1 N}$$

$$\frac{\frac{40 \text{ lbs } N}{ac}}{\frac{10\% N}{10-20-0}} = \frac{40 \text{ lbs } N}{ac} \times \frac{10-20-0}{0.1 N} = 400 \text{ lbs } 10-20-0 / ac$$

So, 400 pounds of this fertilizer are required to obtain 40 pounds of N. Some people are tempted to use multiplication in the first step ($40 \times 10\%$) and get 4 pounds of fertilizer. If logic prevails, this is an obvious mistake: 4 pounds cannot provide 40 pounds!

How much P would that provide? (3 points)

Now is the time for multiplication. It is also the time to remember that P is not what is reported in the grade (P_2O_5). Use the atomic weights to find that P_2O_5 is about 44% P.

$$\frac{400 \text{ lbs } 10-20-0}{ac} \times \frac{20\% P_2O_5}{10-20-0} \times \frac{44\% P}{P_2O_5} = 35 \text{ lbs } P / ac$$

So, 400 lbs of 10-20-0 per acre provides 40 lbs N and 35 lbs P/ac.