Green Tissue Testing with the Spurway Soil Testing Equipment as an Aid in Soil Fertility Studies

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Green tissue testing should be considered as an additional aid in diagnosing the ills of plants or in estimating the productive capacity of a soil. The tests show whether or not there are sufficient available nutrients in a soil to furnish what the plant needs and allow a sufficient excess for storage in the plant. A positive test is an indication that the plant, as of that day, is getting an ample supply of the nutrient being considered. A negative test shows that the plant is getting just enough or too little of that particular nutrient for maximum growth. Naturally, a plant growing where there is a greater supply of nutrients than it needs takes in more than it assimilates. Thus, nutrients are stored to be used when the supply in the soil is inadequate to take care of the current needs of the plant. The green tissue test actually measures the soluble nutrients in storage within the plant. If the particular nutrient in question is found to be stored in the tissue, it is assumed that the plant has not failed to store a supply of the nutrient, it is because there has been an insufficient supply in the soil.

METHODS

The Spurway Simplex soil testing outfit may be used for testing green tissue. No additional reagents or glassware are needed. The tests are indeed simple, but as in the case of soil tests, there is a possibility of error in the interpretation of the results. Perhaps a word of warning is advisable regarding one error which is common.

Plants are generally found to be lower, relatively, in one element than in all others. That element, of course, is the one lowest in the soil in available form and is generally spoken of as the “first limiting factor” in crop production. Say, for instance, that on some particular soil the first limiting factor is nitrogen and the plants are showing symptoms of nitrogen starvation. The tissue test for nitrate nitrogen will be blank, but the tests for phosphorus and potassium may be high. In fact, they are likely to be high, even higher than in normal rapidly growing plants. The tests do not mean, though, that the soil contains sufficient phosphorus and potassium for a normal crop but only that it contains enough for a crop stunted by a shortage of nitrogen. As soon as nitrogen is applied to a crop under such conditions growth is stimulated and in many cases another element, perhaps phosphorus, becomes the first limiting factor. There is a possibility of course that a soil might be extremely low in available nitrogen and actually contain sufficient phosphorus and potassium for a normal crop. Soil tests should make it possible to tell when that condition exists.

DIRECTIONS FOR MAKING GREEN TISSUE TESTS

WITH SPURWAY SIMPLEX SOIL TESTING KIT

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Nitrate nitrogen.—Place thinly cut sections of the leaf petioles in a glass vial (use the special vials graduated 1 and 2). Place the vial one-half full of distilled water, shake for 1 minute. Add 5 drops of reagent 3 (molybdate solution), shake, and add a speck of stannous chloride, perhaps about the size of a pin head. Shake and wait about 2 minutes (not longer than 5 minutes) for the color to develop. It is well to add a little more stannous chloride to see if the color deepens. Too much stannous chloride causes the solution to be cloudy and the color to be green instead of blue. A deep blue color means a high test and is an indication that the plant was obtaining sufficient nitrate at the time the sample was taken. A very light blue or green indicates that the phosphorus supply was not sufficient when the sample was taken.

Phosphorus.—Place 1 cc of thinly sliced tissue in a glass vial. Fill the vial one-half full of cold (below 20° C.) distilled water. Shake for 1 minute. Add 3 drops of reagent 6 (sodium cobaltinitrite solution), shake and add a speck of reagent 6 (95% ethyl alcohol). The reagent 6 should be cold unless the distilled water is cold enough so the distilled water and alcohol will be below 20° C. The reagent 6 should fuse a brown color with a blue color.

Potassium.—Place 1 cc of thinly sliced tissue in a glass vial. Fill the vial one-half full of cold (below 20° C.) distilled water. Shake for 1 minute. Add 3 drops of reagent 1 (sodium cobaltinitrite solution), shake and add a speck of reagent 6 (95% ethyl alcohol). The reagent 6 should be cold unless the distilled water is cold enough so the distilled water and alcohol will be below 20° C. The reagent 6 should fuse a brown color with a blue color.

PORTION OF PLANT TO BE USED IN TESTS

In deciding what portion of a plant to use for green tissue tests, it should be remembered that all three of the nutrients, nitrogen, phosphorus, and potassium, are readily translocated from old to new tissue. For that reason it is more desirable to test both old and new tissue. Usually it is best to test the old tissue. If the test there is high, it may be assumed that a high test will also be obtained on the new tissue. If the old tissue tests low, however, there is a chance that the new tissue may test high. Such results indicate that the plant was obtaining a medium supply of potassium.

In the case of corn, make nitrate tests on the cornhusk before bringing the corn to the ground, phosphorus tests on the stalk near the tassel, and potassium tests on the leaf sheath. Leaf sheaths may be used for the nitrate test. Use the stems for all tests. In the case of alfalfa, make nitrate tests on the young leaf petioles before the plants are cut for hay.