RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS
SCIENTIFIC TREE CARE SINCE 1907

Starch Analysis

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All green plants produce sugar in their leaves during photosynthesis. The sugar is then either used in the leaves as an energy source for growth or production of other essential materials, or it is transported via the phloem (inner bark) to other parts of the tree. The sugar that is not used immediately is linked together in long chains to create starch. Starch is the product the tree uses to store much of its energy reserves. By staining wood for starch, the level of the tree's energy reserves can be estimated. This information is beneficial when making a diagnosis of the tree's condition.

There are numerous factors which can affect starch levels. Basically, anything which weakens or injures the tree will reduce energy reserves. This includes diseases, insect attacks, lack of water and lack of nutrients. When a tree has been determined to be low in starch, the individual factor which is causing the problem must be identified and corrected.

Testing Starch Levels

It is best to compare results with a known healthy tree since there are species differences. Roots are most indicative of the entire tree. Branches respond more quickly to stress factors. Therefore, if a branch test shows that starch has been depleted, roots should be sampled to verify these results. If the branch sample is medium or high, root sampling is generally not required. Trees are stressed if starch reserves are low or depleted.

Starch tests most accurately reflect the condition of the entire tree when conducted on underground roots that are 12 inches (30 cm) out from the root flare. Roots should be at least 3/8" in diameter. Large roots may be sampled with a chisel or increment borer.

Branch samples may also be used to estimate a tree's starch reserves. Samples should be taken from areas receiving maximum sun exposure that are characteristic of the tree. Branches should be at least 3/8" in diameter. The trunk may be sampled with an increment borer. It is not necessary to core more than 2" into the trunk for this sample.

All samples should be trimmed using a sharp knife or pruner to expose a cross section, especially ray cells. Flood the flat area with iodine stain for 30-60 seconds. Remove excess stain and rate samples for starch content (Figures 1 and 2).

Figure 1: Twigs stained at level 1, 2, 3, and 4 from left to right

The U.S. Forest Service has published several species' color standards for rating starch content. In general, four categories used for rating starch are as follows:

1. **High**
   Rays and some or all adjacent wood darkly stained.
2. **Medium**
   Rays only darkly stained.
3. **Low**
   Rays lightly stained.
4. **Depleted**
   No dark stain visible on any tissue.

Figure 2: Roots stained at level 3 and 1 from left to right

The iodine solution should be kept out of the light and replaced every 6-9 months for best results.

Founded in 1926, The Bartlett Tree Research Laboratories is the research wing of Bartlett Tree Experts. Scientists here develop guidelines for all of the Company's services. The Lab also houses a state-of-the-art plant diagnostic clinic and provides vital technical support to Bartlett arborists and field staff for the benefit of our clients.