

Air-fracturing and pneumatic backfill (VOGT) Jon Banks, PhD

Soil compaction and poor drainage can be a major constraint to healthy tree growth preventing water infiltration, drainage and constraining root growth. Soil compaction is particularly common in urban areas caused by high footfall or vehicular traffic. Soil pans as a result of compaction are also responsible for poor drainage in the lower soil horizon. Compaction and soil pans can be alleviated by hypersonic air excavation (Air-spade/Arbex) or air-fracturing and vertical aeration technology known as VOGT Geo-Injector. The VOGT Geo-Injector can be used without grass removal and injections can be made deeper into the soil horizon compared to other de-compaction systems. The process can also involve injection of a porous product such as terramol, vermiculite or perlite (sometimes mixed with biochar). These products can increase soil porosity, encourage drainage, improve nutrient retention and the effectiveness of fertilisation treatments.

Background

Air-fracturing at multiple depths in the soil can relieve compaction, re-aerate the soil profile and improve drainage. This can be achieved by use of a VOGT Geo-Injector machine. Sometimes knowledgeable parties may have heard of a historic machine called a Terravent that was capable of air fracturing and lifting soil. What sets the VOGT apart is its ability to pneumatically inject a porous material into the air space created by the initial air injection. This prevents re-compaction after the initial injection lifts the soil, a known problem with the Terravent system.

The majority of tree roots are located within the top 60cm of the soil profile, they predominate in this zone to harvest water and air from the surface as well as nutrients essential for growth. It is for this reason that hypersonic air excavation (Air-spade/Arbex) within the top 30-60cm is the primary means of alleviating surface soil compaction and

improving root growth and overall plant health.

Figure 1. VOGT machine and PHC staff at Bartlett Research Laboratory.



Air-fracturing is an excellent tool for use where hypersonic air excavation is not possible, such as where grass removal is not desired, in cases of very heavy compaction and urban landscapes where root systems are under impervious surfaces. Where poor drainage is a problem, caused by a soil pan, the VOGT injection lance is capable of reaching lower into the soil horizons and breaking up these pans and directly improving drainage.

Figure 2. Air and porous particle injection under soil surface. (Image credit: VOGT)



The injected porous material (Figure 2) increases porosity within the soil fracture improving drainage. However, owing to the products surface chemistry nutrients are not readily washed through this material, thereby improving nutrient retention, reducing the possibility of nutrient deficiencies and improving the effectiveness of fertilisation.



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