Effect of soil improvement treatment to the tree vitality

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Soil compaction is a major cause of tree decline in urban areas. It reduces the ability of air and water to move through the soil, causes root decline and reduces the physiological vitality of the tree. At present, therefore, site improvements techniques are increasingly used. Compacted soil can be improve by the AirSpade excavation. The positive effect of these treatment based on visual assessment is well described, but further measurement is needed for more accurate determination of the tree vitality.

Objectives

- The aim of the project is to examine **the effect of site improvement** within the root space of the tree **on its immediate vitality**, especially moisture stress.
- Measuring tree vitality using **pressure chamber, dendrometers and PhotosynQ**.

Material

- 8 ***Celtis occidentalis*** **street trees** were evaluated, in Prague city centre. 4 (no.1-4) with site improvement, 4 (no.5-8) without.
- The size of the pavement opening, the type of surrounding paved area was describe.

Soil compaction

The soil in the area of the original and enlarged pavement opening showed an average penetration resistance of **2.77 MPa**. The critical value is **3.3 - 3.7 MPa**.

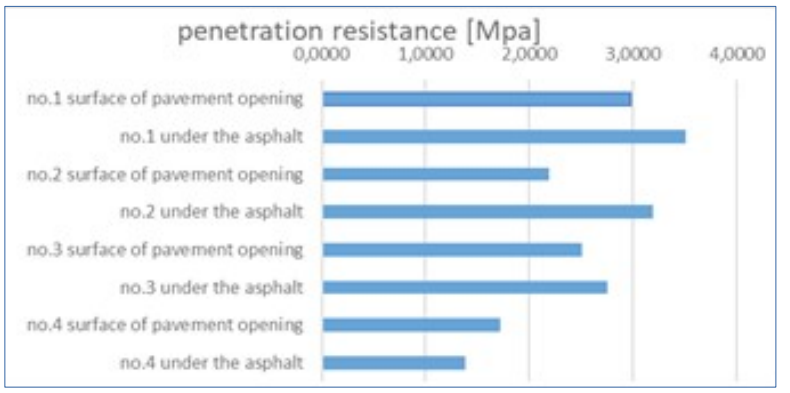


Fig. 1: The penetration resistance of the soil.

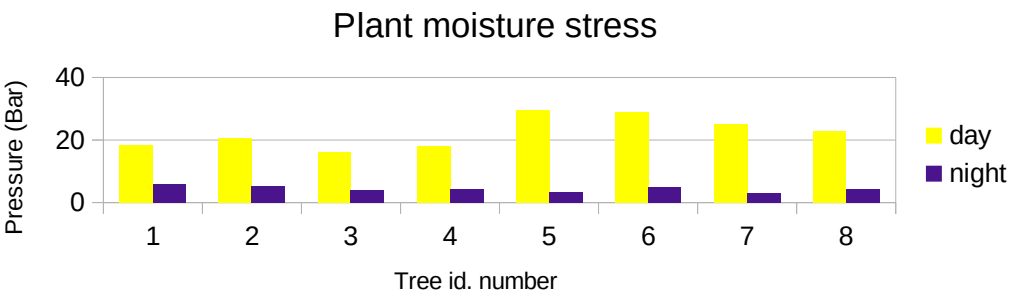
Site improvement - AirSpade

Pavement opening was enlarged by removal of asphalt cover and 20 cm of soil were replaced by structural substrate.

<Fig. 2: AirSpade excavation.

Vitality measurements

Predawn measurements of **Plant Moisture Stress (PMS)** on trees no.1-4 range from 4 to 6 bar, on trees no.5-8 from 3 to 5 bar.
Measurements of PMS during the day on trees no.1-4 range from 16 to 21 bar, on trees no.5-8 from 23 to 30 bar.
Dendrometer and PhotosyncQ measurements did not show significant difference.



Tab. 1: Plant moisture stress.

Conclusion

- **Removal of the asphalt cover** and **replacement of the surface layer** of the soil caused significant **decrease of Plant Moisture Stress** as the measurements using pressure chamber show.
- All four improved trees showed PMS under 20 bar or slightly above. All four trees without improvement showed PMS above 20 bar. As PMS increases above 20 bar plant vigor declines.
- Further measurements are needed after a longer period following the treatment, when the effect of a new rooting within the added substrate is expected.

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