WASSERVERBRAUCH UND WACHSTUMSDYNAMIK VON *QUERCUS FRAINETTO* UND *TILIA CORDATA*

- WATER USE AND GROWTH DYNAMIC OF QUERCUS FRAINETTO AND TILIA CORDATA

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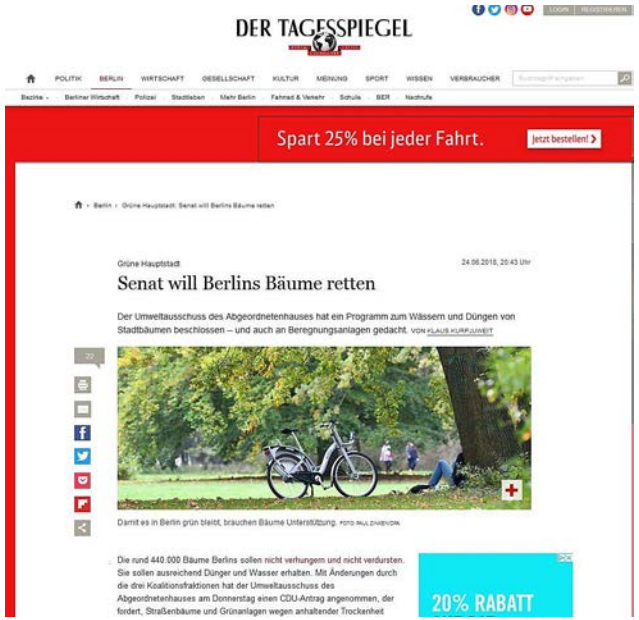
Introduction

- Increase of drought periods in springtime in recent years
- Increase of drought periods in summer and autumn
- Unbalanced precipitation in the course of the year
- Drought years 2015, 2018, 2019



Introduction

Projekt
„Wasserhaushaltsmodellierung zur Erhöhung der Resilienz von Straßenbäumen in Berlin“

Partner
- Pflanzenschutzamt Berlin
- SenUVK Abt. III Klimaschutz/Klimaanpassung
- Deutscher Wetterdienst (DWD)
- Naturwissenschaftlicher Verein Eberswalde e.V.

Finanzierung
- Berliner Energie- und Klimaschutzprogramm 2030

Dauer
- 10/2018 – 12/2021

Main topics

- Developing model calculation for specific irrigation recommandations for (roadside) trees.
- Comparison of determined data with water balance data from forest ecology.
- Reaction of growing rates by city trees in different soils while drought periods.
- **Measurements of different reaction patterns by different tree species while drought periods.**

Methods

- Research field located in Eberswalde/Brandenburg
- Six lysimeters are in use for the research since spring 2019
- Every Lysimeter were planted with two trees, double times additional irrigation
- Lysimeter surface were covered with mulch
- Additional measurements of sapflow (one per tree species), radial stem growth (six per tree species), soil moisture (Sentek) and weather conditions.
- Determined evapotranspiration are weekly values refered to water balance equation

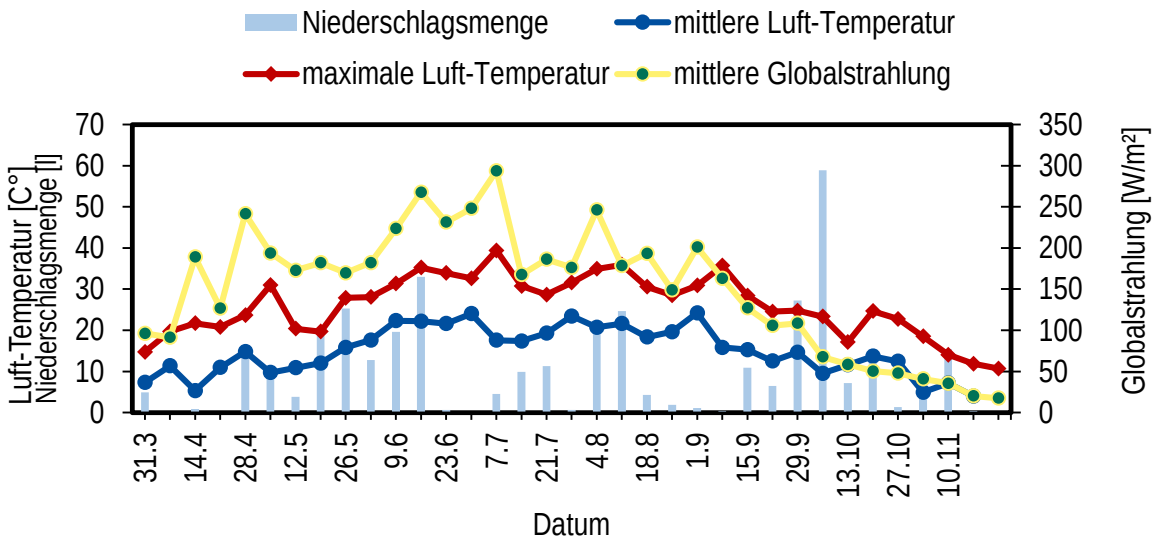
$$V = Dw + (N100 * A) - D$$

V = Evapotranspiration (l)
Dw = Lysimeter weight (kg)
N100 = Rain sum in 100 cm (mm)
A = Lysimeter-area (m^2)
D = Efflux (l)

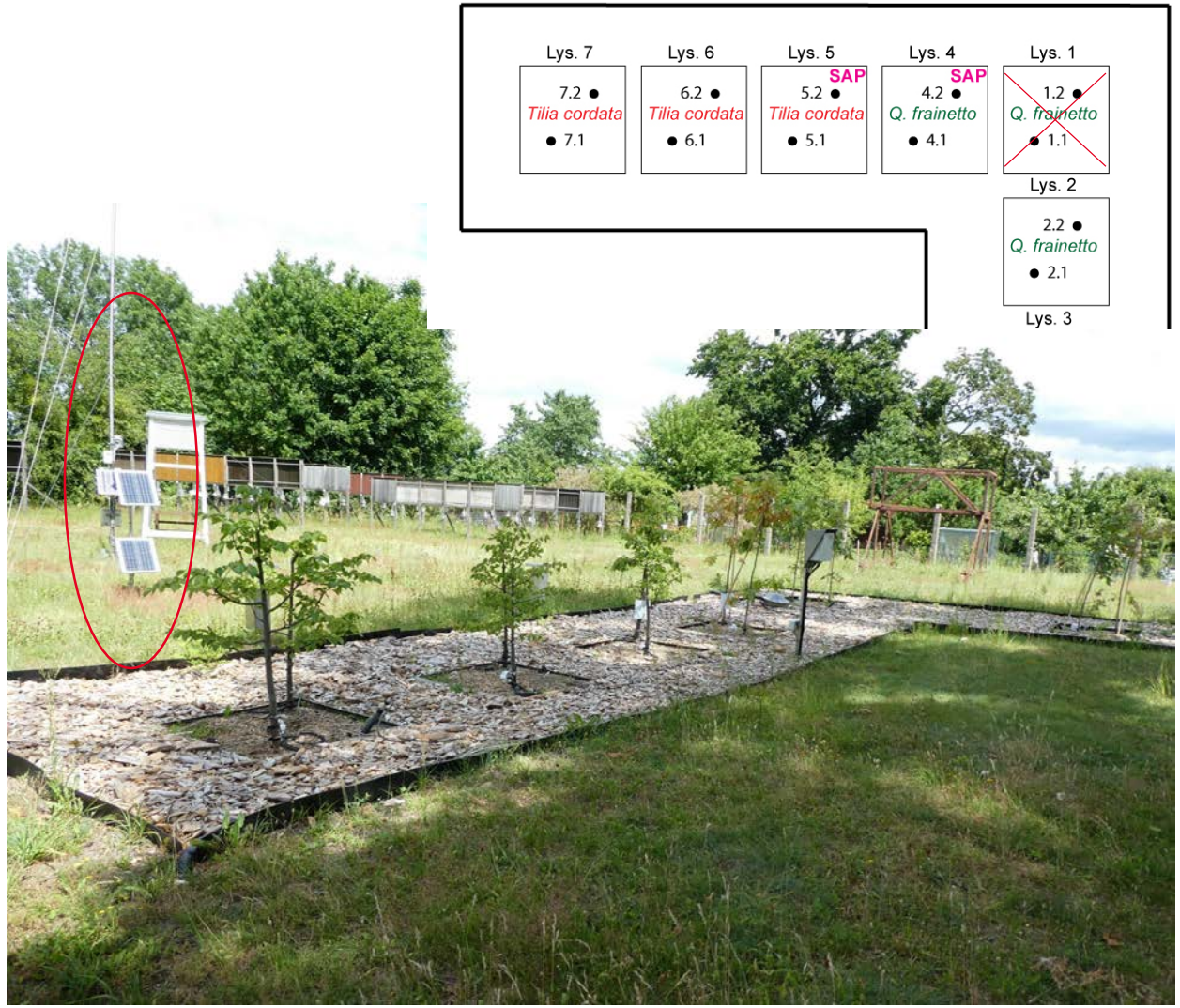
Lysimeterstation Drachenkopf/Eberswalde

Wasserverbrauch und Wachstumsdynamik von *Quercus frainetto* und *Tilia cordata*

Results



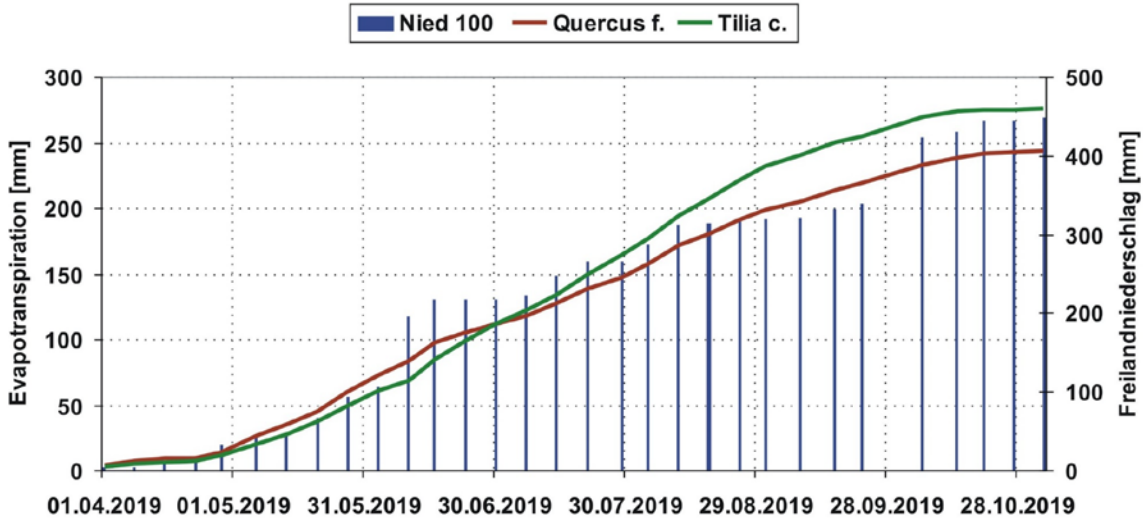
- Rain sum (march – nov. 2019) of 370 mm
- Three periods of drought (may, june/july, august/sept.)
- 27 heat days, T_{max} > 35°C on 7 days end of june
- Leaf shoot start *Quercus frainetto* KW 14
- Leaf shoot start *Tilia cordata* KW 16



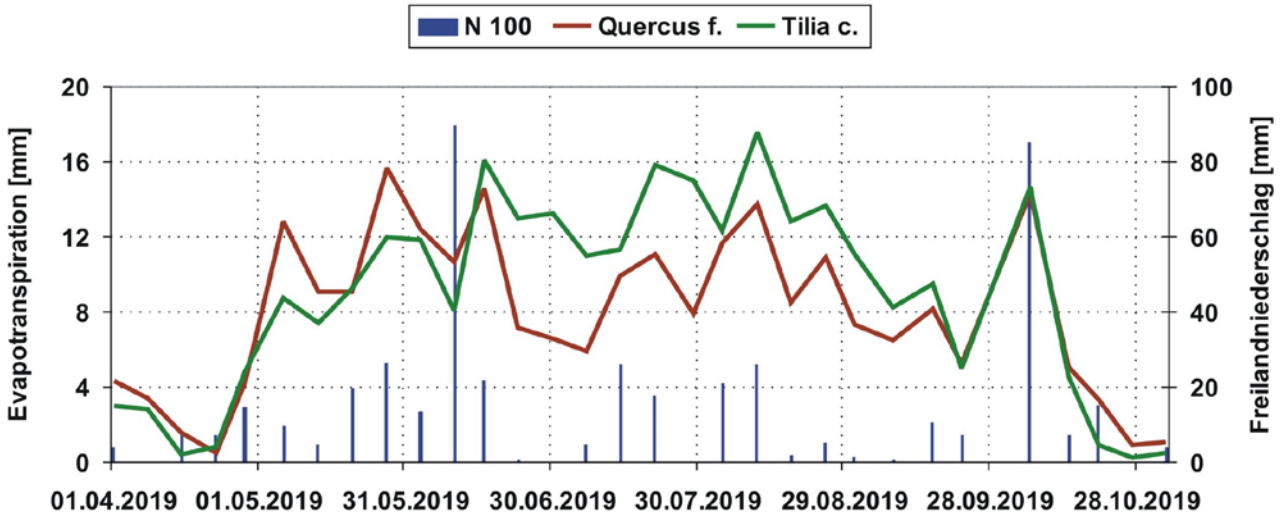
Lysimeterstation Drachenkopf/Eberswalde

Wasserverbrauch und Wachstumsdynamik von *Quercus frainetto* und *Tilia cordata*

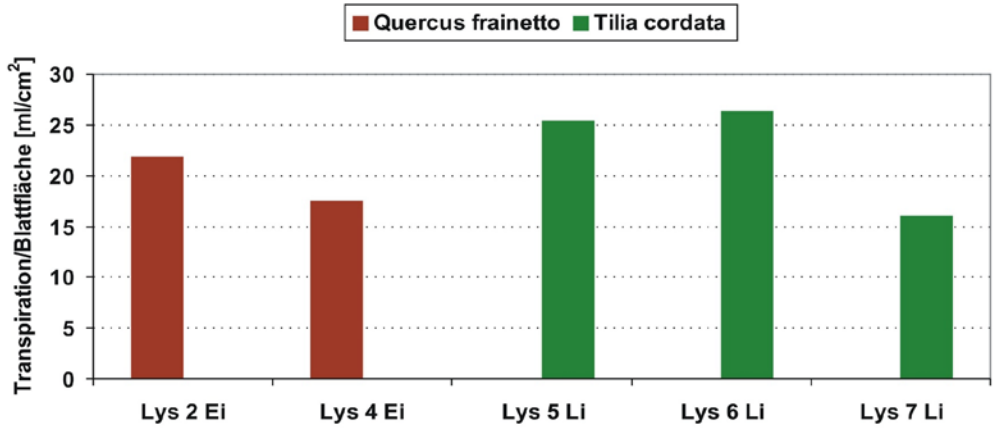
Results



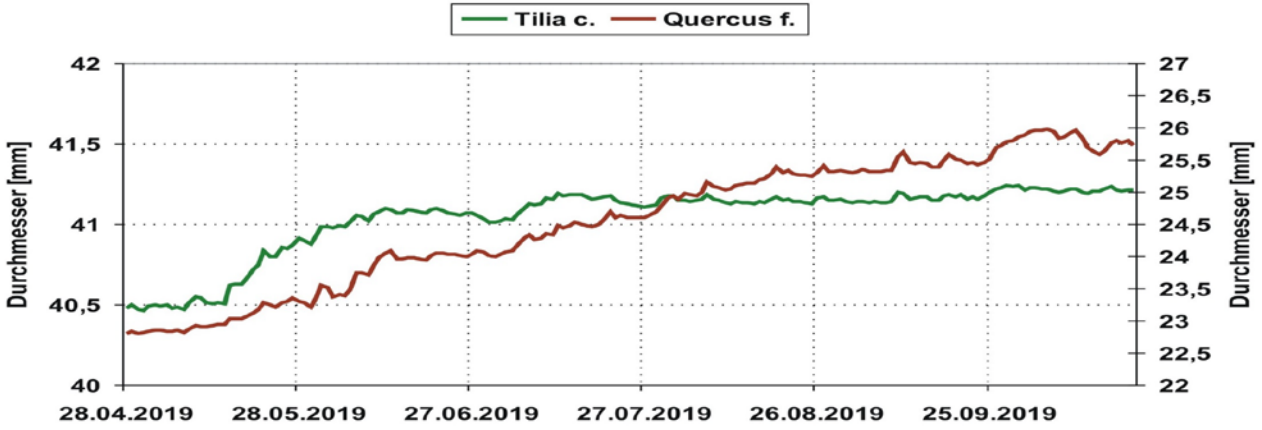
- *Acumulated evapotranspiration depending of the tree species*



- *Dynamic of the weekly evapotranspiration depending of the tree species*



- *Ratio amount of transpiration/leaf area*



- *Radial stem growth*

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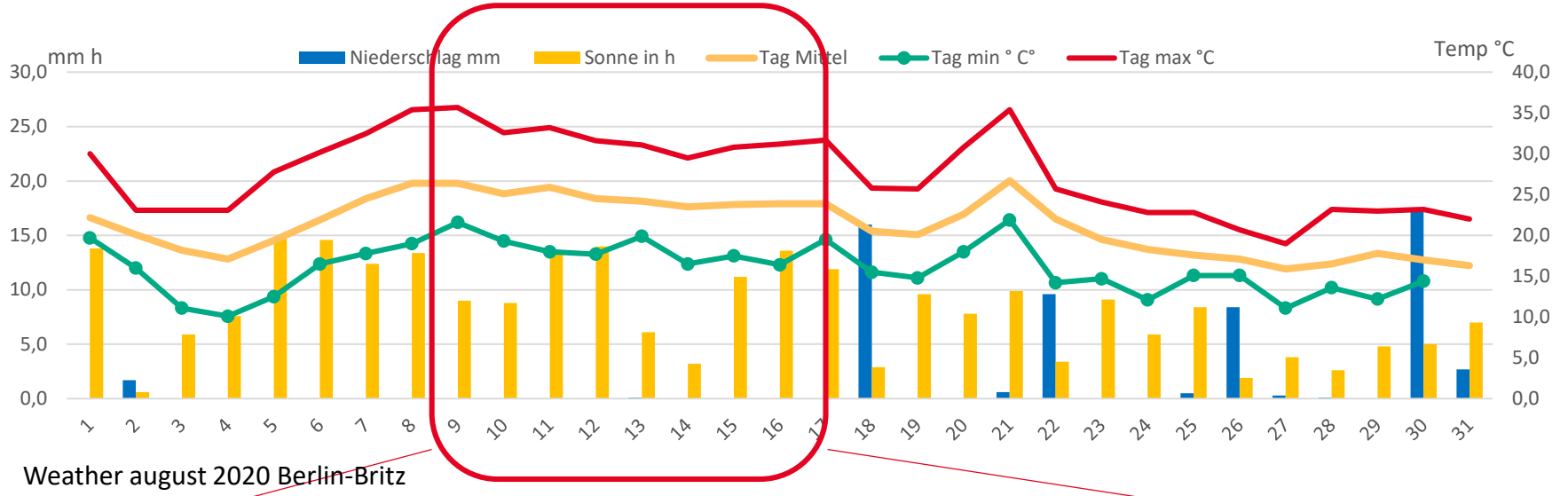
Discussion

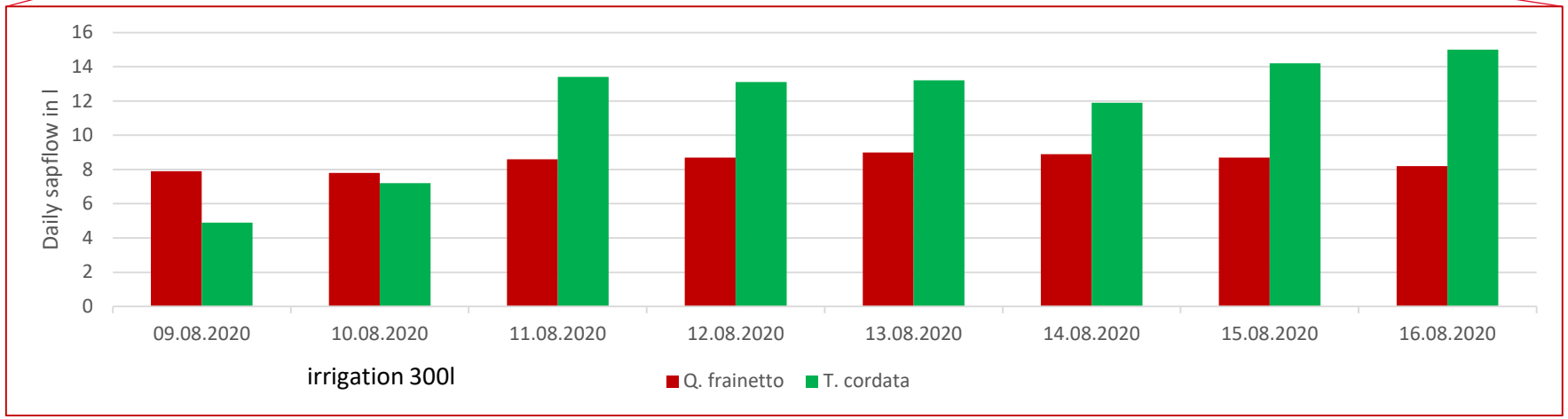
- There are small differences of the amount of the transpiration of both tree species detectable. A higher transpiration could be proved by *T. cordata* compared to *Q. frainetto*.
- Both tree species response on drought periods in addition of high temperatures and high global radiation in june 2019 with a reduction of the daily sapflow amount.
- But there is a less reaction detectable by *Quercus frainetto* compared to *Tilia cordata* in august 2019*.
- There are also differences in the radial stem growth on both tree species detectable. *T. cordata* stopped stem growth in mid of august 2019. *Q. frainetto* stopped stem growth with the end of vegetation period (mid of october).

Wasserverbrauch und Wachstumsdynamik von *Quercus frainetto* und *Tilia cordata*

Discussion*, results of 2020 studies on road side trees in Berlin



Weather august 2020 Berlin-Britz



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Conclusion

- Differences in the water balance of both tree species could be proven.
- Differences in the total water consumption both in terms of level and in the annual dynamics in the study period became clear.
- *T. cordata* reacts more strongly with a reduction in transpiration rates than *Q. frainetto* during drought periods with decreasing amounts of soil water.
- The growth rates of *Q. frainetto* up to the end of the vegetation period increase steadily after a summer drought, while *T. cordata* shows only slight trunk growth from this point on.
- This leads to the conclusion that *Q. frainetto* as a future tree species for inner-city locations under forecast changed climatic conditions has advantages in terms of growth behavior in terms of drought tolerance, growth and carbon fixation compared to *T. cordata*.
- In order to further validate this, the investigations to expand the database will be continued until the end of 2021.

Vielen Dank.

Further information: https://www.berlin.de/pflanzenschutzamt/stadtgruen/

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