Trial report

‘Air-Pot grown trees compared to the growth of trees in the open field’ 2020

December 2020

Cultus Crop Research BV
Chiel van der Voort

Content

1. Introduction

In the end of 2018, the company 'Air-Pot' has set up a trial to compare the growth of trees cultivated in a 7.5L and 45L Air-Pot Kit in comparison with the growth of trees in the open field. After taking measurements in the first trial year and reporting them, the trees of the 7.5L were potted over in a 100L Air-Pot Kit for further growing in 2020. The trees in the 45L were not potted over in a bigger Air-Pot Kit.

Cultus Crop Research is asked for an independent reporting of the measurements. The assessments are performed by 'Air-Pot' (Bas van Dijk) and Cultus Crop Research (Chiel van der Voort) together, this report describes the findings of both the first and second year of the demonstration trial. Cultus Crop Research is specialised in research for all agriculture and horticulture sectors in the Netherlands such as demonstrations and screenings, carrying out test platforms, tests with statistical justification and integrity surveys for private GEP certification. Cultus Crop Research is in the possession of both the TNG certificate and the GEP certificate, which means that they are authorised to carry out tests with not yet certified pesticides.

Client **: Air-Pot**
Contact : Bas van Dijk, Rutger Hornikx

Reporting **: Cultus Crop Research BV**
Contact : Chiel van der Voort

Trial location **: Boom. 'De Kwekerij'**
: Oirschot, the Netherlands

2. Trial execution

2.1 Trial goal

Goal of this demonstration trial is to show the added value of Air-pot grown trees above the cultivation in the open field. Because the trial was set up as a demo, no statistical processing occurred and only findings will be described. Starting plantmaterial is grown in an Air-pot U system and supplied by 'Volentis'.

2.2 Trial setup

Period: Year 1; October 2018 – October 2019
Year 2; October 2019 – October 2020

Replications: None

Trees per object: 25

Crops: Carpinus betulus 'Lucas'
Liquidambar styraciflua 'Worplesdon'
Tilia europaea 'Pallida'

Objects per crop:
Year 1; Air-Pot Kit 7.5 L
Air-Pot Kit 45.0 L
Open field

Year 2; Air-Pot Kit 45.0 L
Air-Pot Kit 100 L (trees from 7.5L potted over)
Open field

Potting soil recipe Air-pots: 30% Baltic peat – Fine grade
20% Baltic peat – Medium grade
20% Irish peat
30% Coco (fiber and chips)

Soil classification open field: Light sandy loam

Basic fertilization Air-Pot: Osmocote Exact 16-18M, 15-8-11+2MgO+TE
Micromax Premium

Basis fertilization Open field: Osmocote PrePlant 16-18M, 17-8-10+2MgO+TE
Micromax Premium
Compost before planting

Fertilization regime: In addition to the fertilizer regime below, in the Air-Pot objects extra fertilazation is given by the fertigation system of Boom 'De Kwekerij' with an additional EC of 0.6-0.8.

	7.5L Air-Pot (year 1)		**45L Air-Pot**		**100L Air-Pot** (year 2)		**Open field (per tree)**	
	Osmocote	**Micromax**	**Osmocote**	**Micromax**	**Osmocote**	**Micromax**	**Osmocote**	**Micromax**
Carpinus	65g	2.5g	250g	15g	250g	15g	250g	15g
Liquidambar	65g	2.5g	250g	15g	250g	15g	250g	15g
Tilia	70g	2.5g	275g	15g	275g	15g	275g	15g

2.3 Aims and measurements

To measure the tree growth in the different systems (Air-Pot and open field), the diameter of the stem is measured using a caliper at a height of 1m above the soil surface. Aim of the demo is to have a comparison of the following objects;

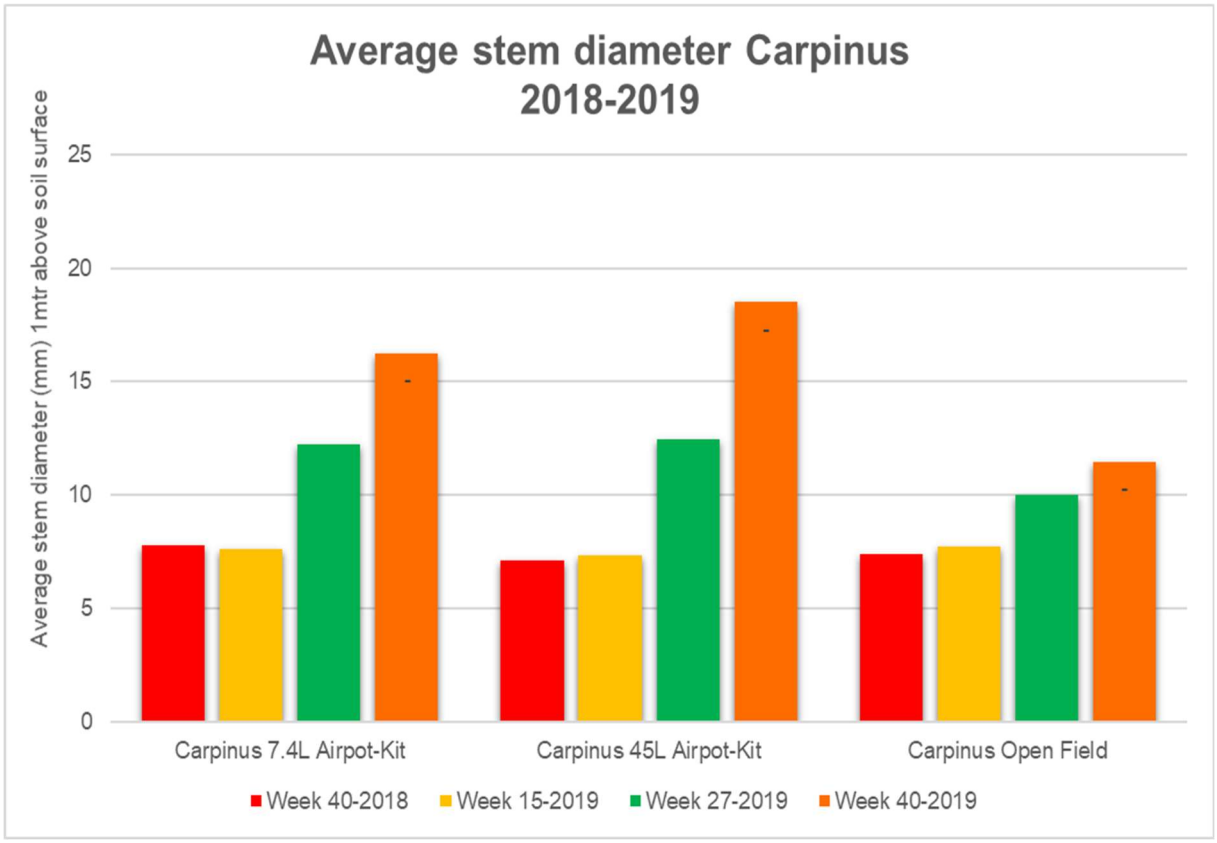
- The growth rate of the trees grown in a 7.5L Air-Pot to those in the open field (year 1)
- The growth rate of the trees grown in a 45L Air-Pot to those in the open field
- The growth rate of the trees grown in a 100L Air-Pot (from 7.5L) to those in the open field (year 2)
- The growth rate of the trees grown in a 7.5L Air-Pot to those in a 45L Air-Pot (year 1)
- The growth rate of the trees grown in a 45L Air-Pot to those in a 100L Air-Pot (year 2)

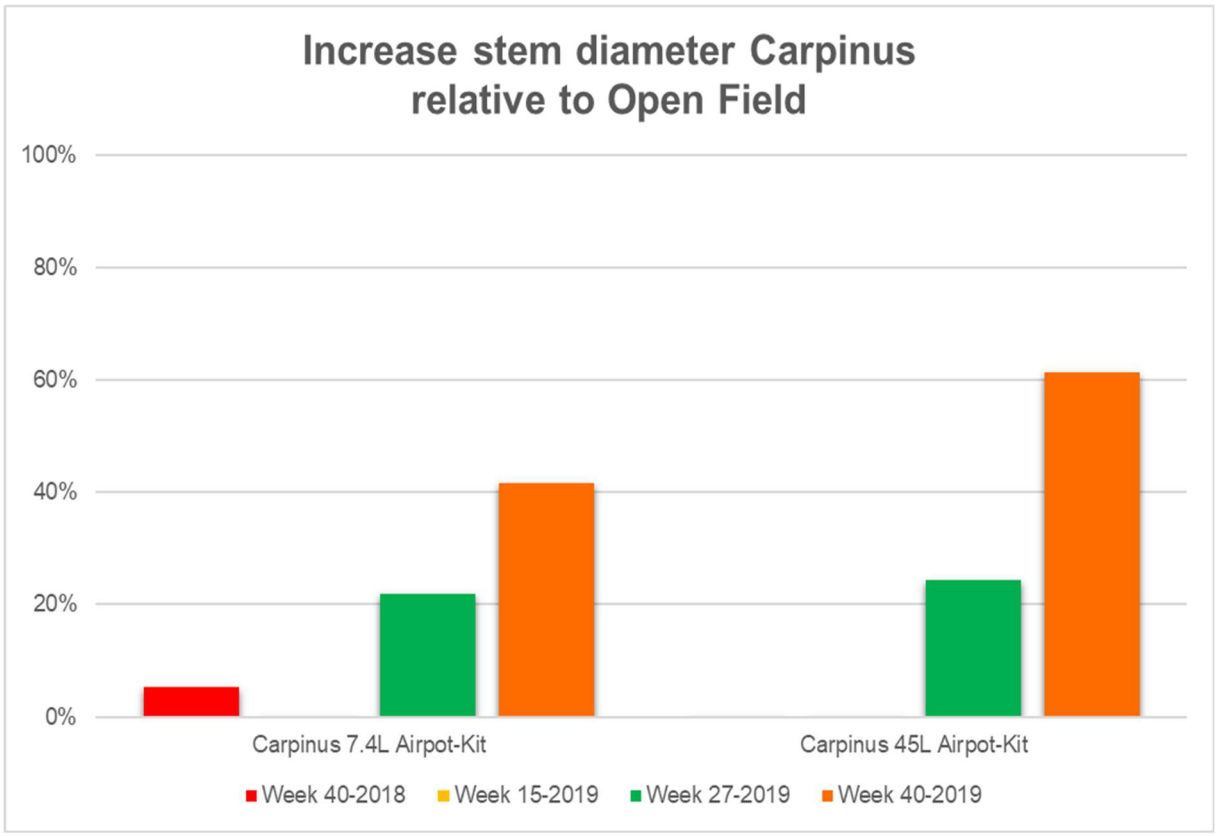
2.3.1. Measurement timing

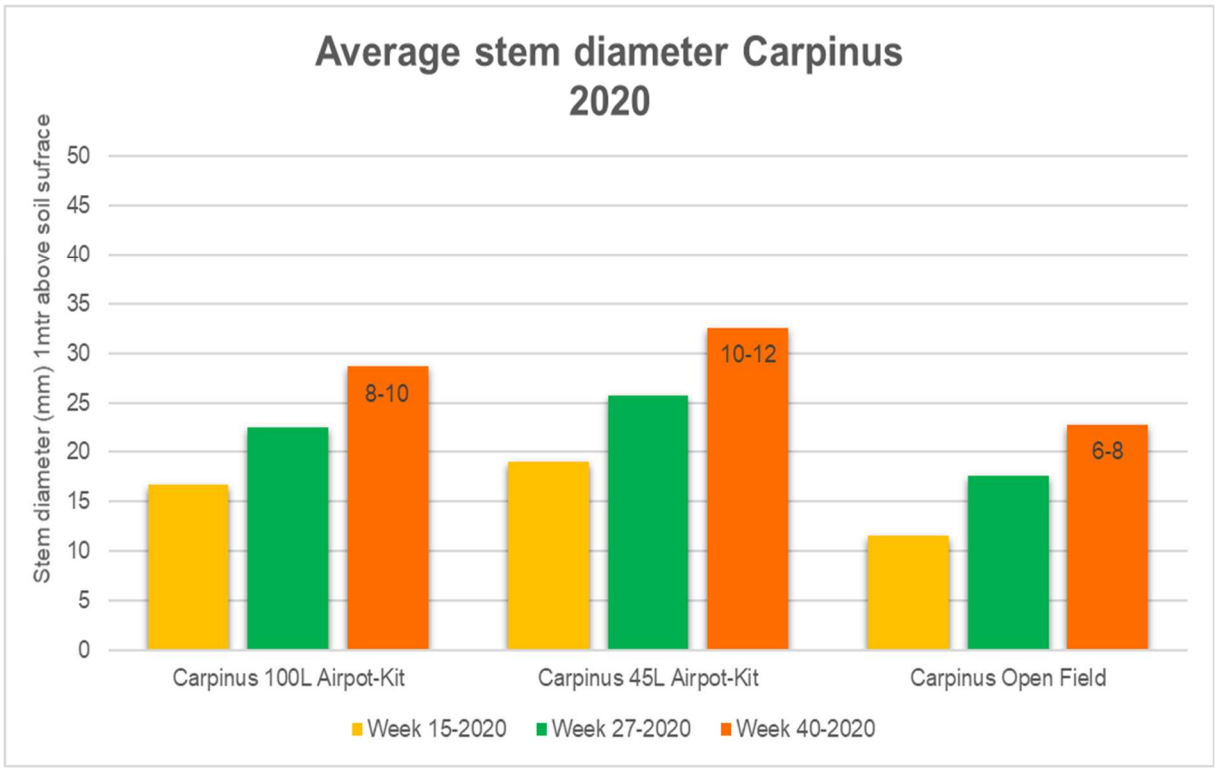
During the season measurements were taken in week 40-2018 and week 15, 27 and 40 in both 2019 and 2020. Within each plot the diameter (mm) of all 25 trees have been measured. The average diameter in each object at the different times is shown in the following figures.

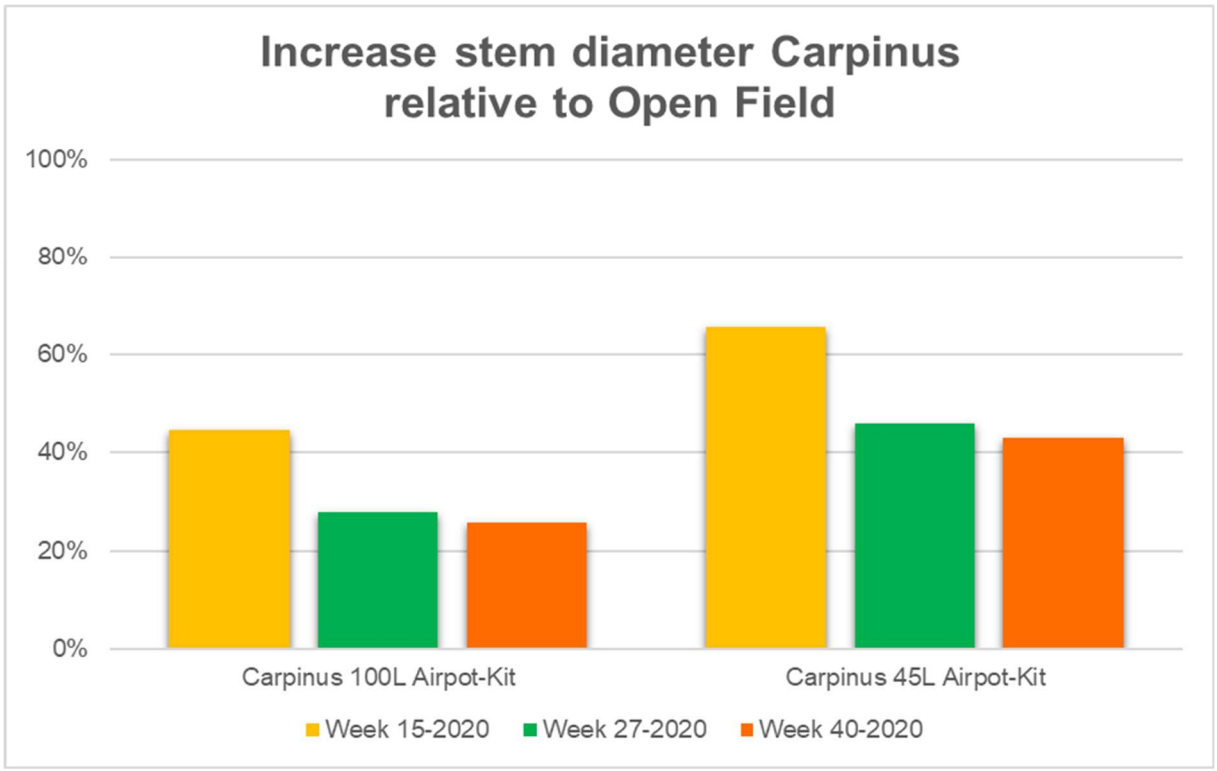
3. Elaboration of the assessments

3.1 Carpinus betulus 'Lucas'

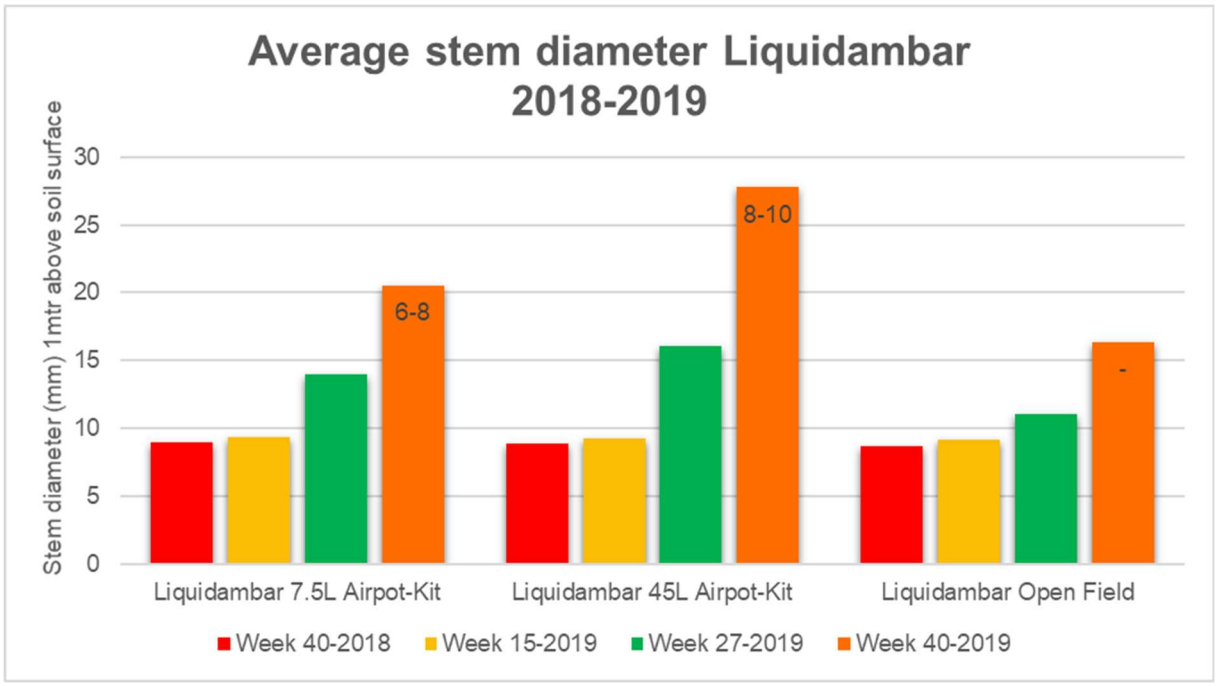


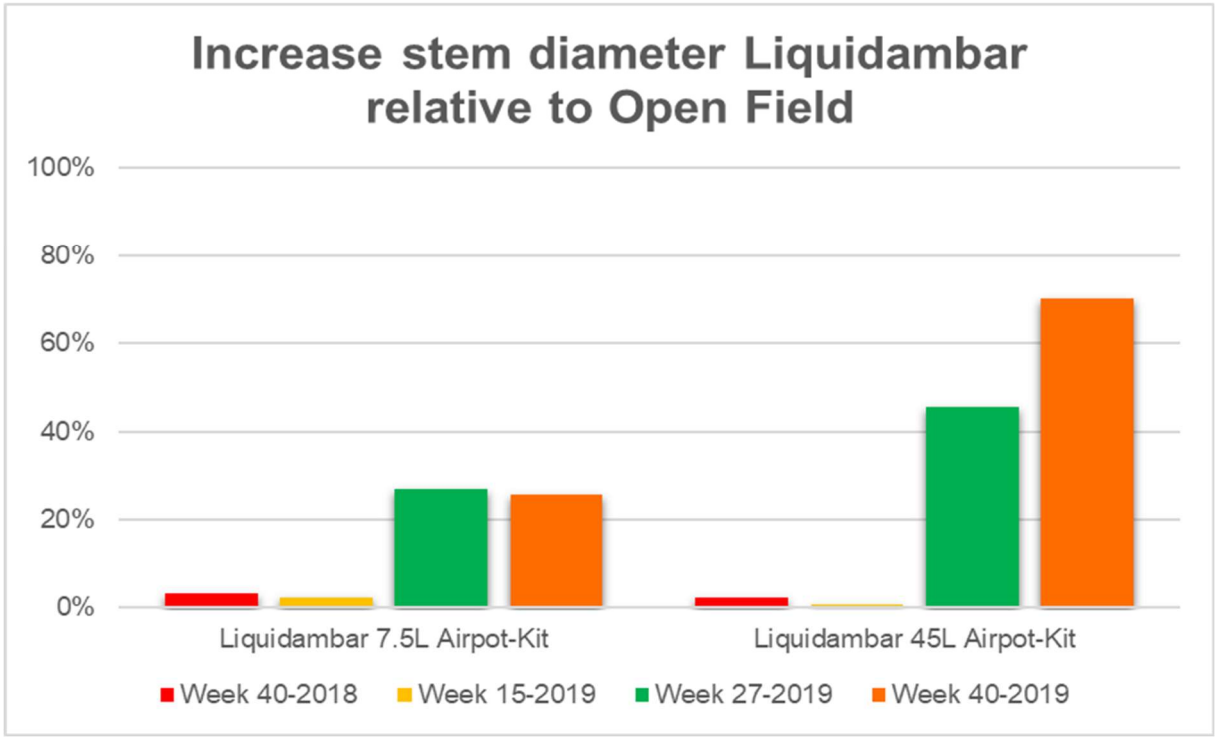


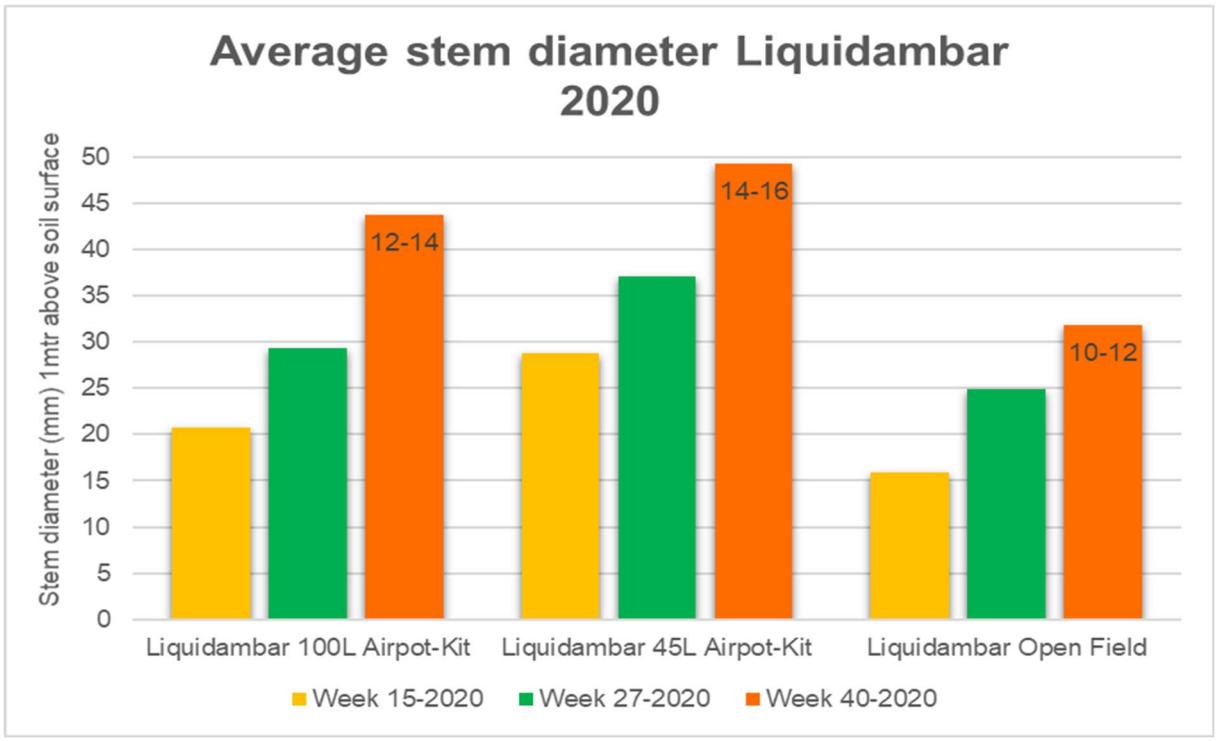

Average stem diameter Carpinus 2020
Stem diameter (mm) 1 mtr above soil sufrace
50
45
40
35
30
25
20
15
10
5
0
8-10
10-12
6-8
Carpinus 100L Airpot-Kit
Carpinus 45L Airpot-Kit
Carpinus Open Field
Week 15-2020
Week 27-2020
Week 40-2020

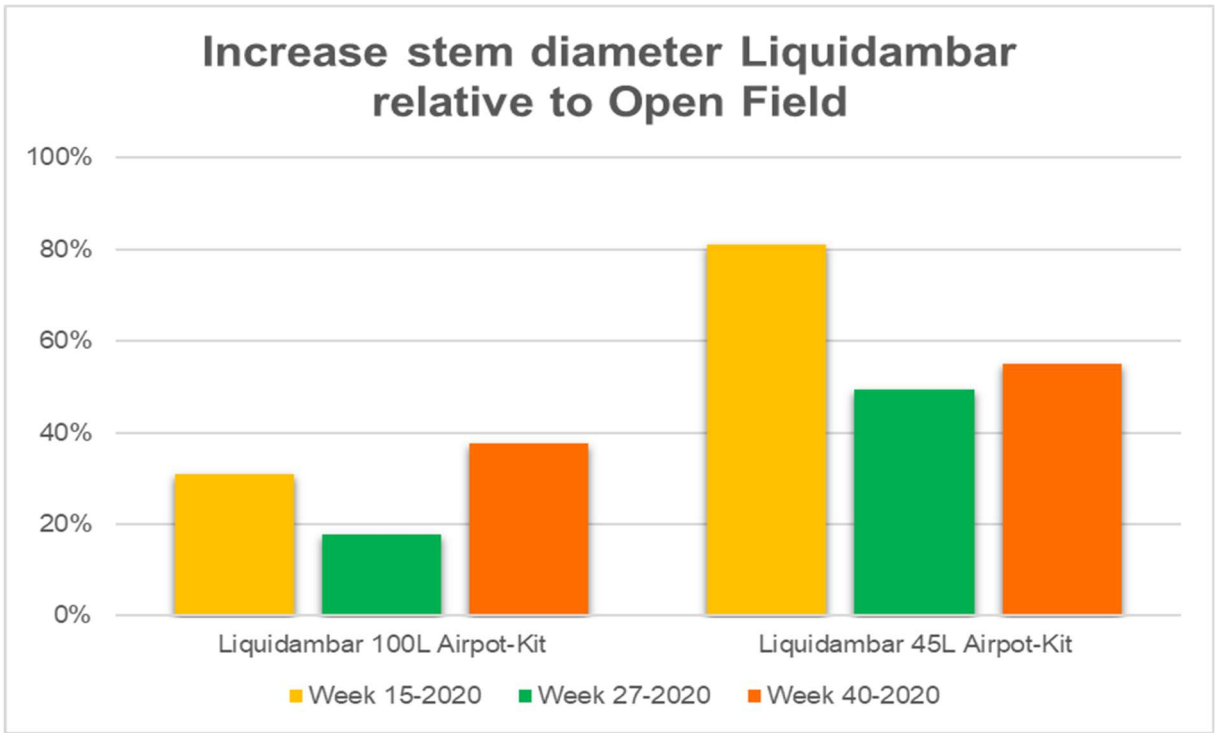

Increase stem diameter Carpinus relative to Open Field
100%
80%
60%
40%
20%
0%
Carpinus 100L Airpot-Kit
Carpinus 45L Airpot-Kit
Week 15-2020
Week 27-2020
Week 40-2020

3.2 Liquidambar styraciflua 'Worplesdon'

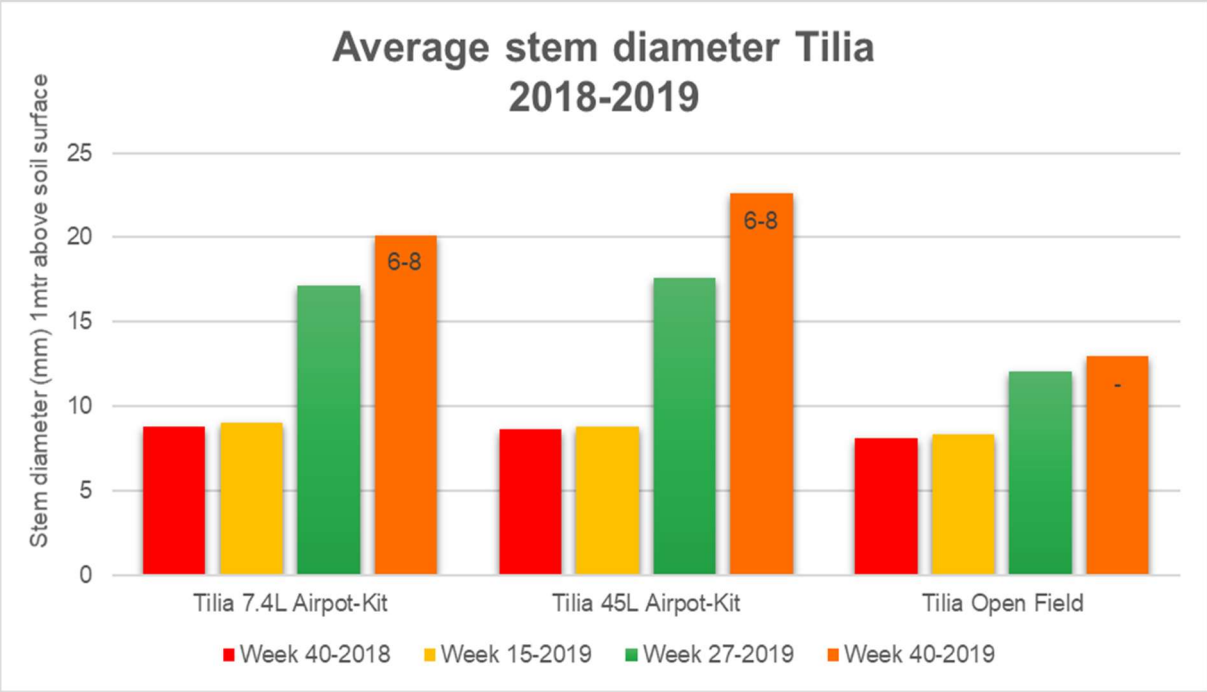


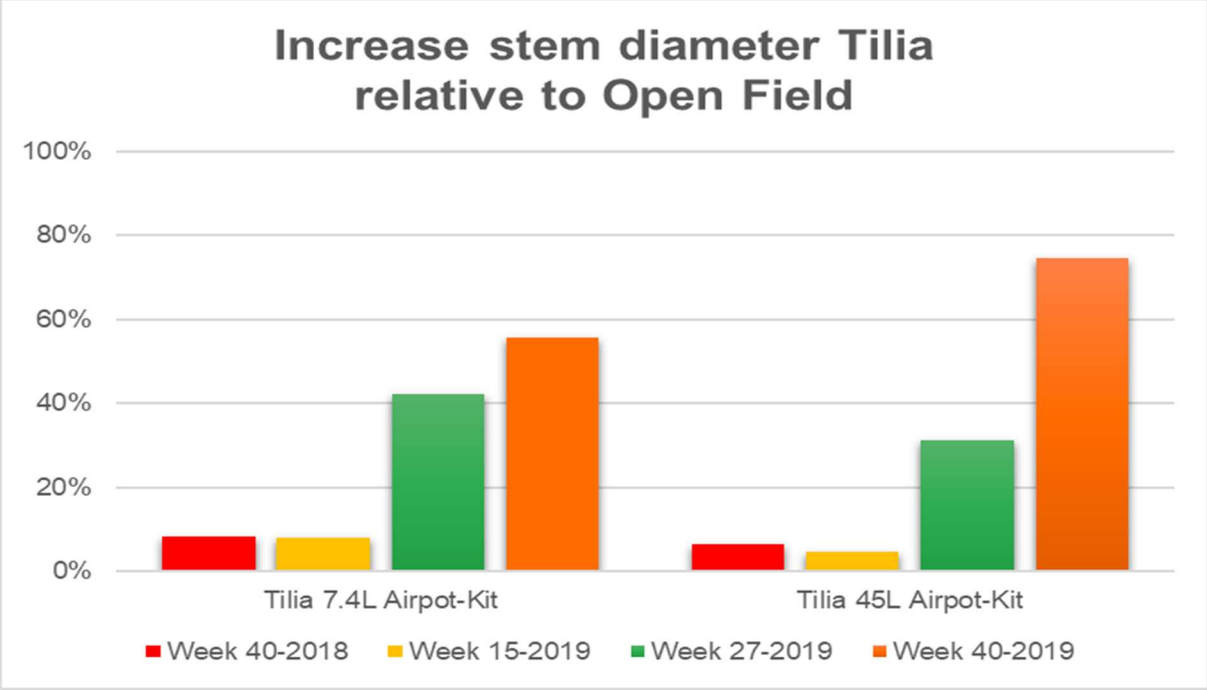


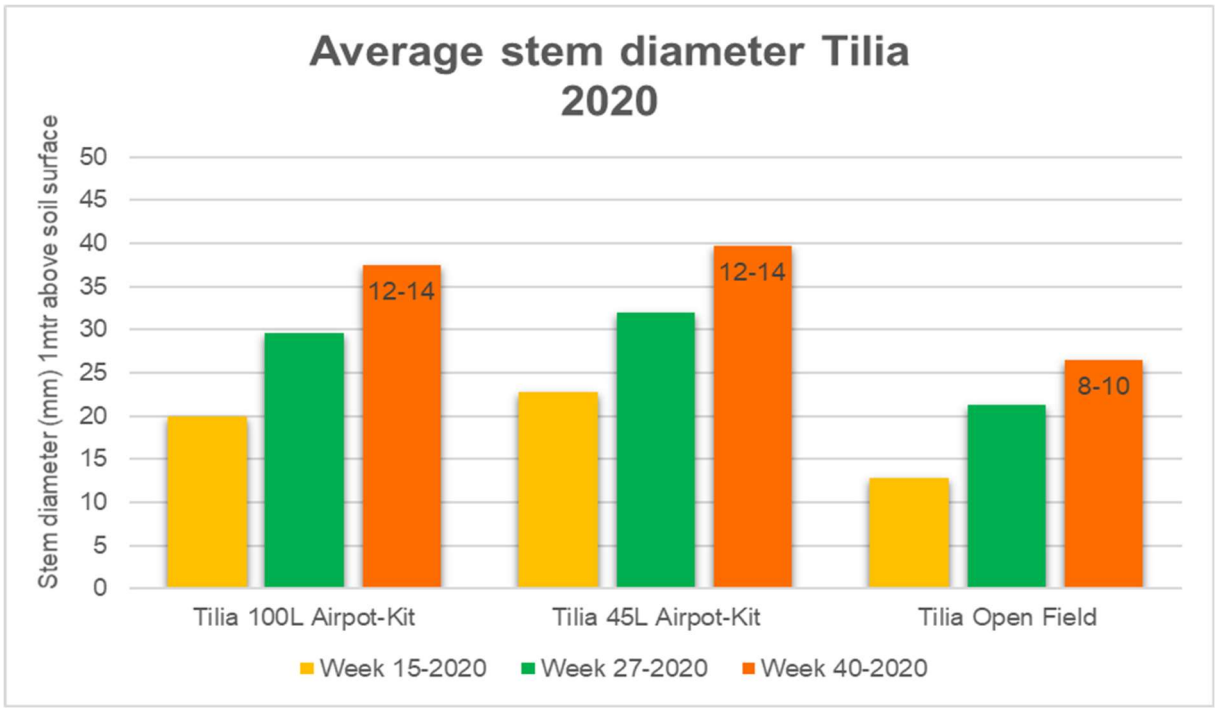

Average stem diameter Liquidambar 2020
Stem diameter (mm) 1mtr above soil surface
50
45
40
35
30
25
20
15
10
5
0
12-14
14-16
10-12
Liquidambar 100L Airpot-Kit
Liquidambar 45L Airpot-Kit
Liquidambar Open Field
Week 15-2020
Week 27-2020
Week 40-2020

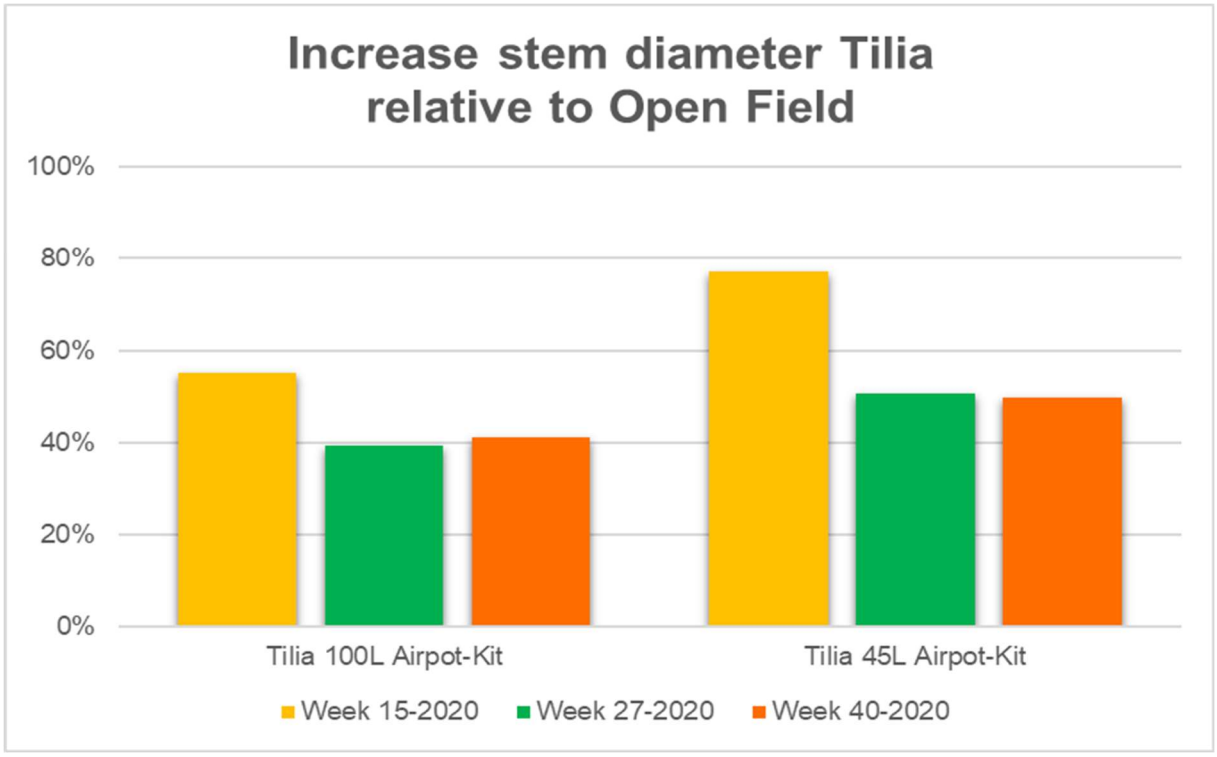

Increase stem diameter Liquidambar relative to Open Field
100%
80%
60%
40%
20%
0%
Liquidambar 100L Airpot-Kit
Liquidambar 45L Airpot-Kit
Week 15-2020
Week 27-2020
Week 40-2020

3.3 Tilia europaea 'Pallida'






Average stem diameter Tilia 2020
Stem diameter (mm) 1mtr above soil surface
50
45
40
35
30
25
20
15
10
5
0
12-14
12-14
8-10
Tilia 100L Airpot-Kit
Tilia 45L Airpot-Kit
Tilia Open Field
Week 15-2020
Week 27-2020
Week 40-2020


Increase stem diameter Tilia relative to Open Field
100%
80%
60%
40%
20%
0%
Tilia 100L Airpot-Kit
Tilia 45L Airpot-Kit
Week 15-2020
Week 27-2020
Week 40-2020

4. Findings

Year 1 – 2019

The differences in stem thickening originated from week 15 of 2019, after the winter period. In all three cultivars the stem diameter of the Air-Pot grown trees is increased in comparison with the trees grown in the open field. In Carpinus and Tilia the stem development of both 7.5L and 45L is almost equal until week 27 of 2019. In Liquidambar the differences in stem diameter occur already at week 15 of 2019. At the last observation in all three cultivars the thickest average stem diameter is obtained in object 'Air-Pot 45L'.

After the first year cultivation in a 7.5L Air-Pot has led to an increase of the stem diameter of 26-56% compared to the cultivation in the open field. Cultivation in a 45L Air-Pot has even led to an increase of the stem diameter of 61-75% compared to the cultivation in the open field.

Year 2 - 2020

In the second year, trees cultivated in de open field have made a growth spurt compared to the growth in the first year. Nevertheless, differences between cultivation in the 45L Air-Pot Kit and 100L Air-Pot Kit compared to cultivation in the open field are still visible.

In the first year trees in the 45L Air-Pot Kit took the lead regarding stem diameter. Trees from the 7.5L Air-Pot Kits which were potted over in a 100L Air-Pot Kit did not match the average stem diameter as obtained in the 45L Air-Pot Kits yet. So in practise, it seems to be more efficient to plant the trees directly in a 45L Air-Pot Kit to obtain a bigger stem.

After the second year cultivation in a 100L Air-Pot Kit (potted over from a 7.5L Air-Pot Kit) led to an increase of the stem diameter of 26% - 41% compared to the cultivation in the open field. Cultivation in the 45L Air-Pot Kit led to an increase of 43% - 55% compared to the cultivation in the open field after 2 years of growing.

General

A number of advantages of cultivation in an Air-Pot have emerged from the demonstration trial:

- Increase of the stem diameter
- Increase of the crop growth, trees cultivated in the Air-Pot have a fuller crown
- Possibility of fertigation, more efficient control of fertilization and irrigation
- More compact root growth
- More flexibility of the trees during the growing season

Appendix 1; Pictures year 1

Figure 1: Liquidambar after one year, grown in the open field

Figure 2: Liquidambar after one year, grown in a 45L Air-Pot

Figure 3: Compact root development in Air-Pot

Appendix 2; Pictures year 2

Figure 4: Carpinus betulus 'Lucas' 7-10-2020 Left 100L Air-Pot Kit, Right 45L Air-Pot Kit

Figure 5: Liquidambar styraciflua 'Worplesdon' 7-10-2020 Left 100L Air-Pot Kit, Right 45L Air-Pot Kit

Figure 6: Tilia europaea 'Pallida' 7-10-2020 Left 100L Air-Pot Kit, Right 45L Air-Pot Kit

Figure 7: Carpinus betulus 'Lucas' 7-10-2020 Open Field

Figure 8: Liquidambar styraciflua 'Worplesdon' 7-10-2020 Open Field

Figure 9: Tilia europaea 'Pallida' 7-10-2020 Open Field