Tree nursery center of excellence
Ellerhoop,
Schleswig-Holstein,
Germany

Results of some recently completed ***"research"***

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Structure of talk

1. Who am I, what do I do and where the hell is Ellerhoop (where I work and live)?

2. Regulations for peat reduction in growing media in horticulture / tree nurseries in Germany

3. Results with different peat substitutes in the culture of woody plants in containers (Focus 1)

4. Organic fertilization compared to mineral fertilization (coated fertilizers) in container grown woody plants (Focus 2)

5. Variety differences in cherry laurel (*Prunus laurocerasus*) with respect to leaf damage caused by sodium/natrium in irrigation water (Focus 3)

6. First findings/observations on the topic "climate change and tree ranges of the future" (only if still time and very compactly summarized)

*I. Who am I, what **I'm** doing and where?*

- ✓ That's me (Age: 58)
- ✓ Dr. rer. hort. (for horiculture) Andreas Wrede
  Chamber of agriculture Schleswig-Holstein (LKSH), Dept. Horticulture
  Thiensen 16
  D-25373 Ellerhoop
- ✓ Senior of the Experimental Station for horticulture
- ✓ I have been working there since October 2003
- ✓ Trained gardener
- ✓ Worked for many years as a landscape gardener and in tree nurseries
- ✓ Studied and received PhD (Dr. rer. hort.) in horticulture at the University of Hanover
- ✓ worked in a soil testing laboratory before moving to LKSH getting senior of Experimental Station

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*I. Who am I, what **I'm** doing and where?*

1. Where the hell is Ellerhoop

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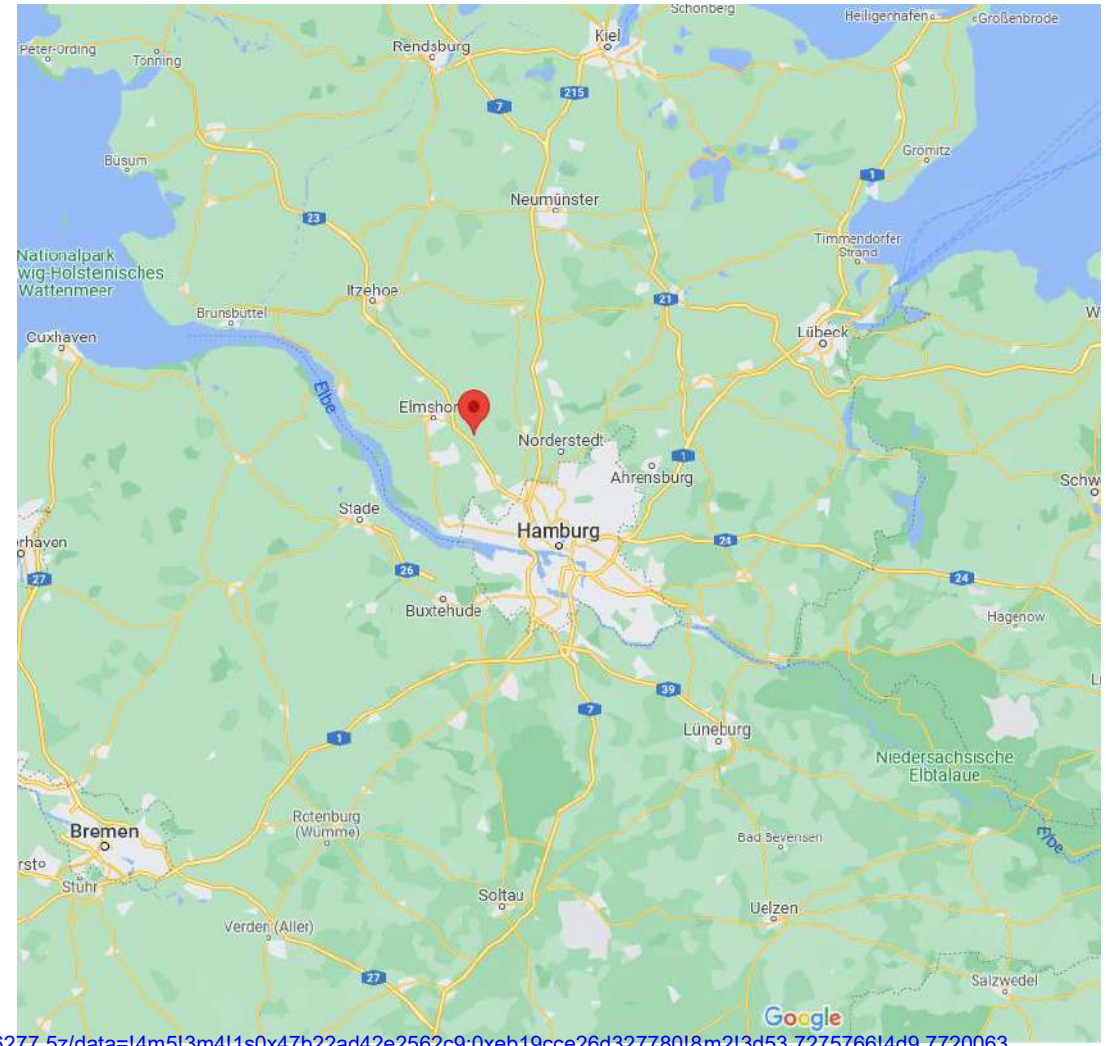
*I. Who am I, what **I'm** doing and where?*

1. Where the hell is Ellerhoop

- ✓ Ellerhoop is located in the northernmost federal state of Germany, in Schleswig-Holstein, near Hamburg
- ✓ Ellerhoop is located middle of Pinneberg district



https://www.google.com/maps/place/Ellerhoop/@53.2720778,17.2296277,5z/data=!4m5!3m4!1s0x47b22ad42e2562c9:0xeb19cce26d327780!8m2!3d53.7275766!4d9.7720063

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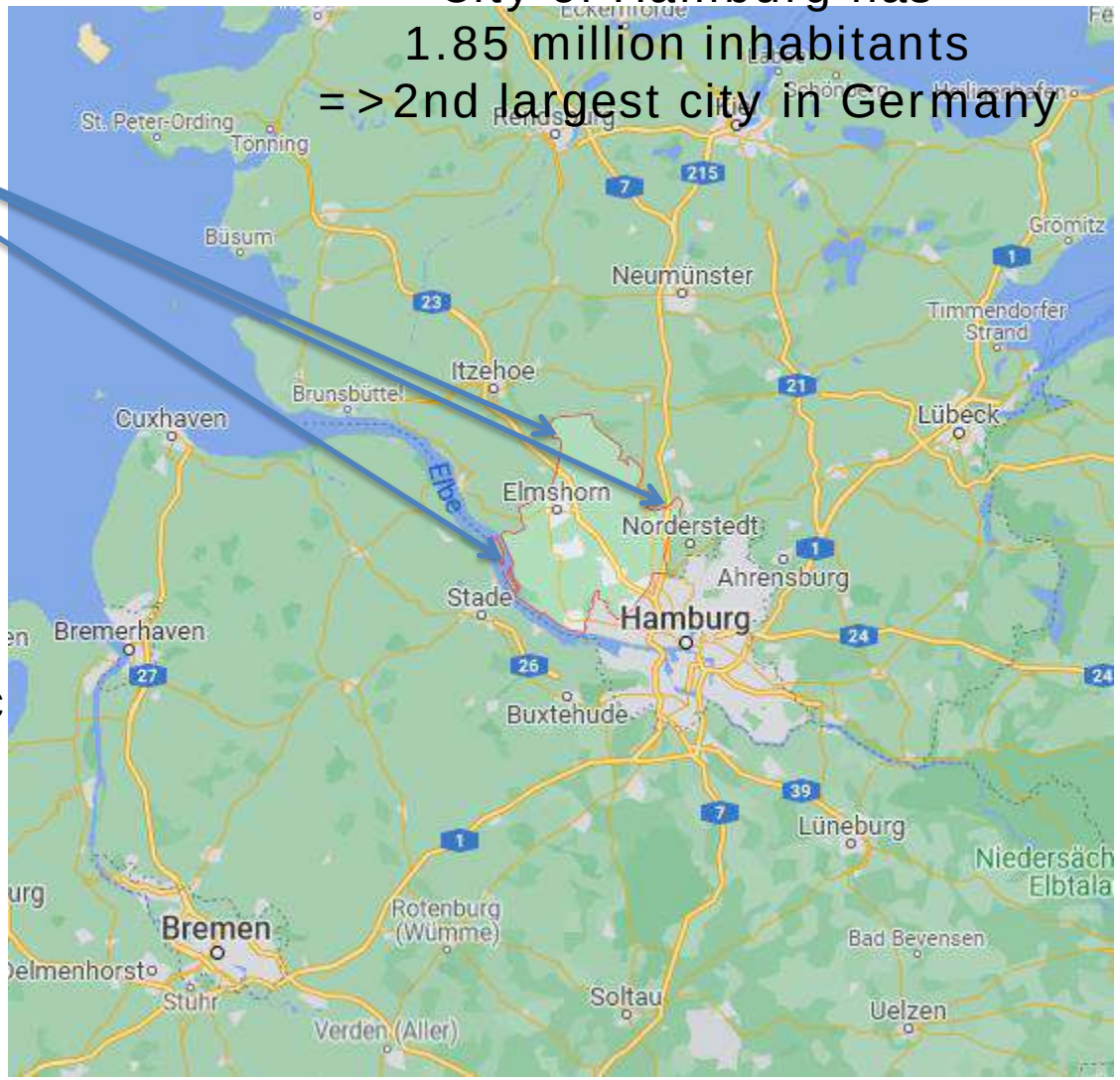
*I. Who am I, what **I'm** doing and where?*

1. Where the hell is Ellerhoop

City of Hamburg has
1.85 million inhabitants
=>2nd largest city in Germany



- ✓ The red line shows the boundaries of the district of Pinneberg,
- ✓ It is the (second) largest closed nursery area in Germany
- ✓ The district of Pinneberg is located northwest of Hamburg. By car it takes 20 minutes (without traffic jam) to the center of Hamburg.
- ✓ However, traffic jam is the normal case and not free roads
- ✓ Most residents commute to work to Hamburg

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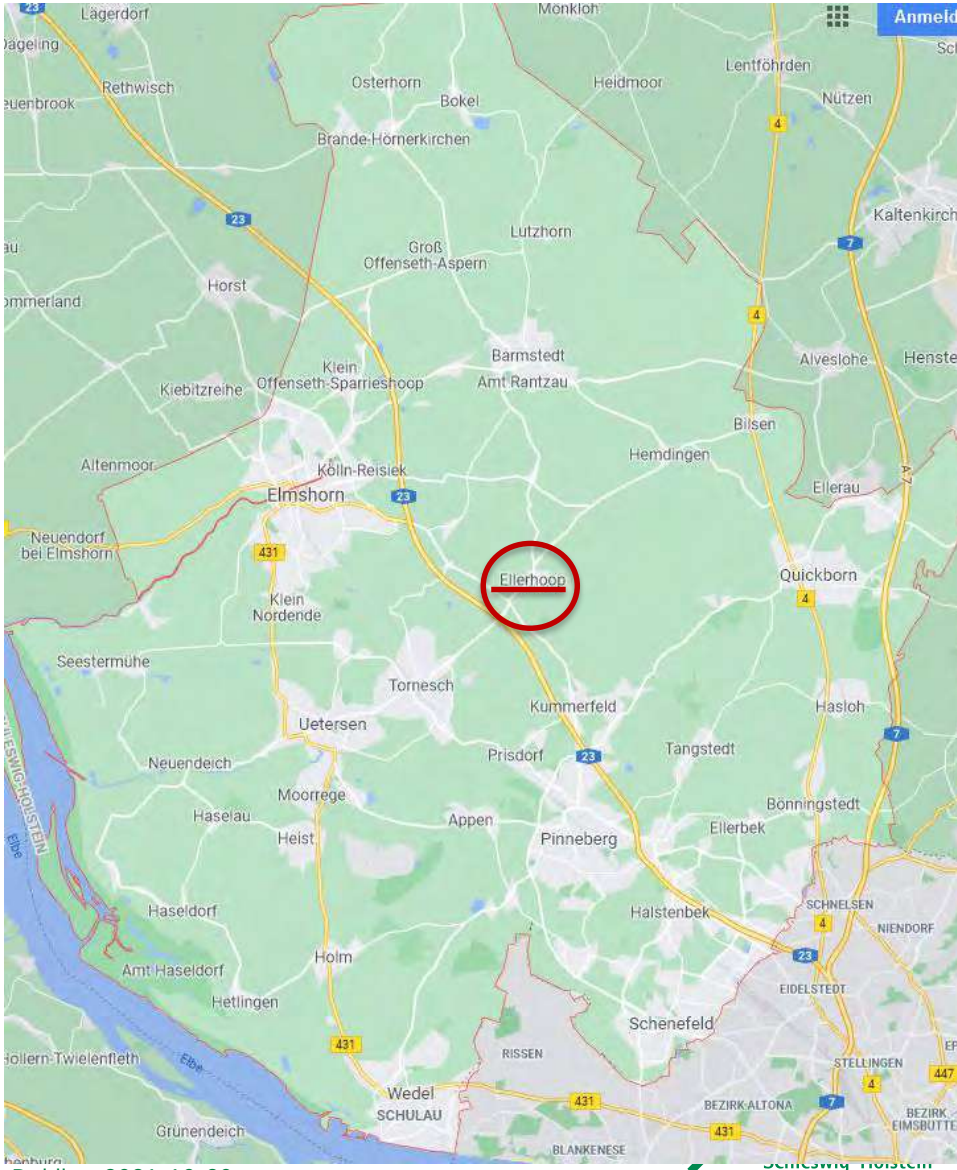
*I. Who am I, what **I'm** doing and where?*

2. Some short details of pinneberg nursery area

- ✓ 292 nurseries with 3522 ha of production area are located in the district of Pinneberg – one of the largest closed nursery areas in the world with over 200 years of tradition

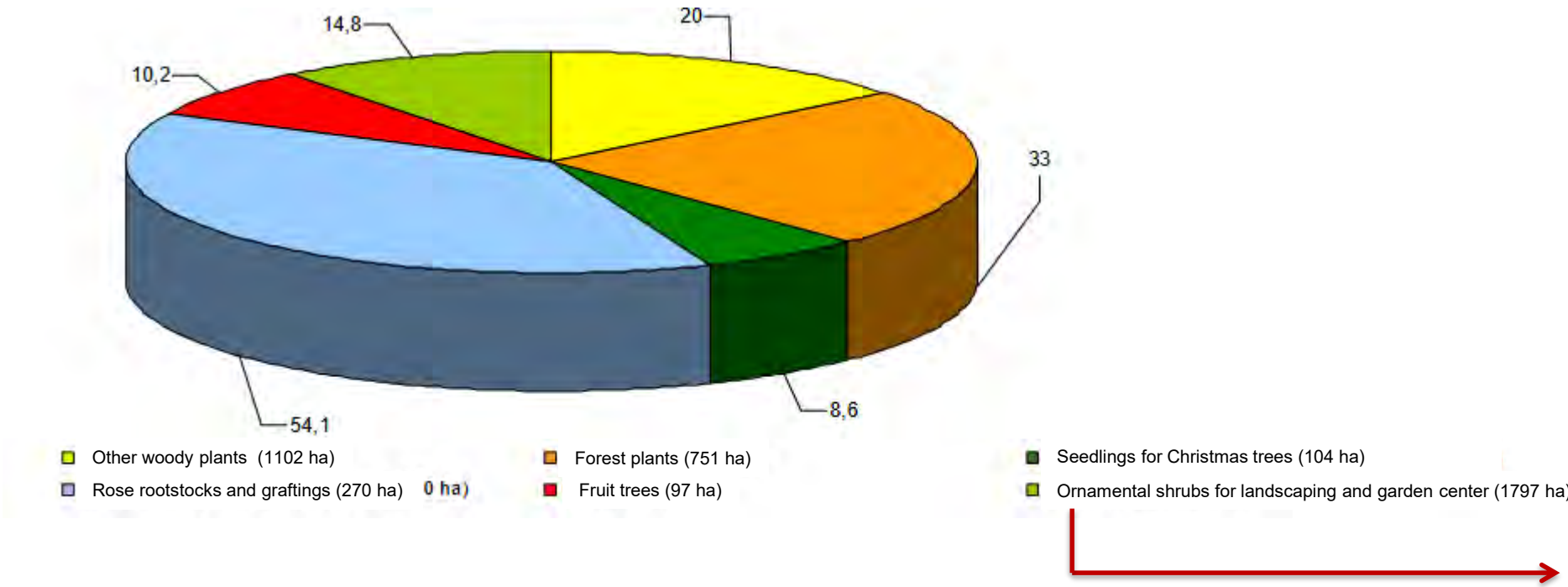
- ✓ The horticultural center from Schleswig-Holstein Chamber of Agriculture, where I work and where the Experimental Station is located, lies in the heart of the Pinneberg nursery area



I. Who am I, what I'm doing and where?

2. Some short details of pinneberg nursery area

Schleswig-Holstein's percentage share of total German nursery areas by type of use



Quoted according to: https://www.bdb-schleswig-holstein.de/35.html => homepage of the Schleswig-Holsteine Nurserie association

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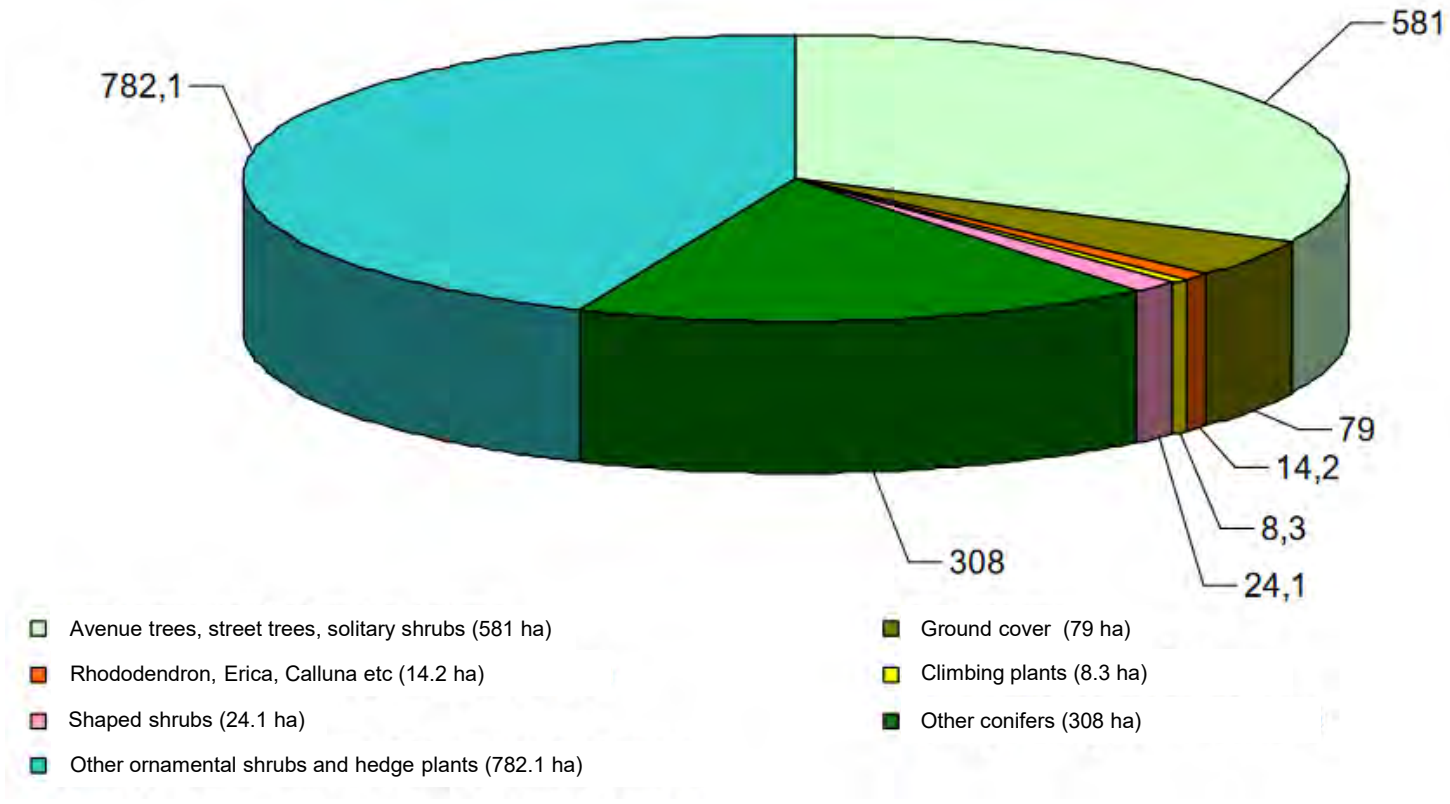
I. Who am I, what I'm doing and where?

2. Some short details of pinneberg nursery area

Subdivision of the sector Ornamental shrubs for landscaping and garden center (1797 ha).



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*I. Who am I, what **I'm** doing and where?*

3. Some short details of Chamber of Agriculture Schleswig-Holstein

- ✓ The Chamber of Agriculture Schleswig-Holstein (LKSH) is a corporation or institution under public law
- ✓ It has about 400 employees – 45 of them are in charge of horticulture
- ✓ Budget of approximately 35 Million Euro per year
- ✓ How does our finar
  - Approximately om the agricultur ed according to the
  - another 35 % ent services
  - about 5 % of o asing (the chamber o
  - only the remain (as public money o

Headquarters of LKSH
in Rendsburg, Schleswig-Holstein

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*I. Who am I, what **I'm** doing and where?*

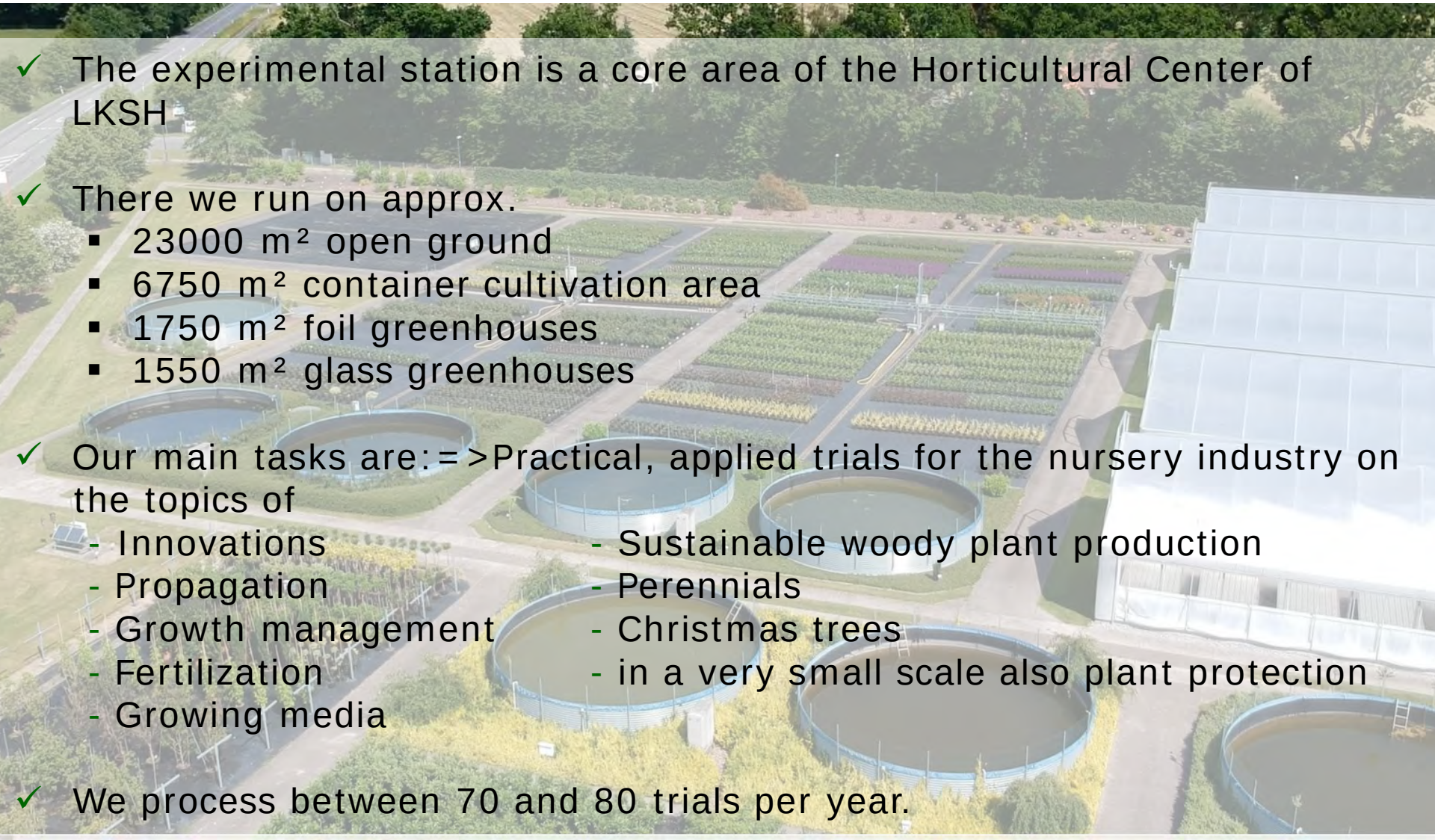
4. Horticultural Center of the LKSH

- ✓ The department horticulture, the smallest of seven departments of LKSH, is concentrated in our horticulture center in Ellerhoop

- ✓ In the department horticulture we have three areas of work:
  - horticultural education
  - consulting
  - experimental station (This is my main task)

*I. Who am I, what **I'm** doing and where?*

5. The experimental station = Competence center for tree nursery



- ✓ The experimental station is a core area of the Horticultural Center of LKSH

- ✓ There we run on approx.
  - 23000 m² open ground
  - 6750 m² container cultivation area
  - 1750 m² foil greenhouses
  - 1550 m² glass greenhouses

- ✓ Our main tasks are: =>Practical, applied trials for the nursery industry on the topics of
  - Innovations
  - Propagation
  - Growth management
  - Fertilization
  - Growing media
  - Sustainable woody plant production
  - Perennials
  - Christmas trees
  - in a very small scale also plant protection

- ✓ We process between 70 and 80 trials per year.

II. Regulations for peat reduction in Germany

II. Regulations for peat reduction in Germany

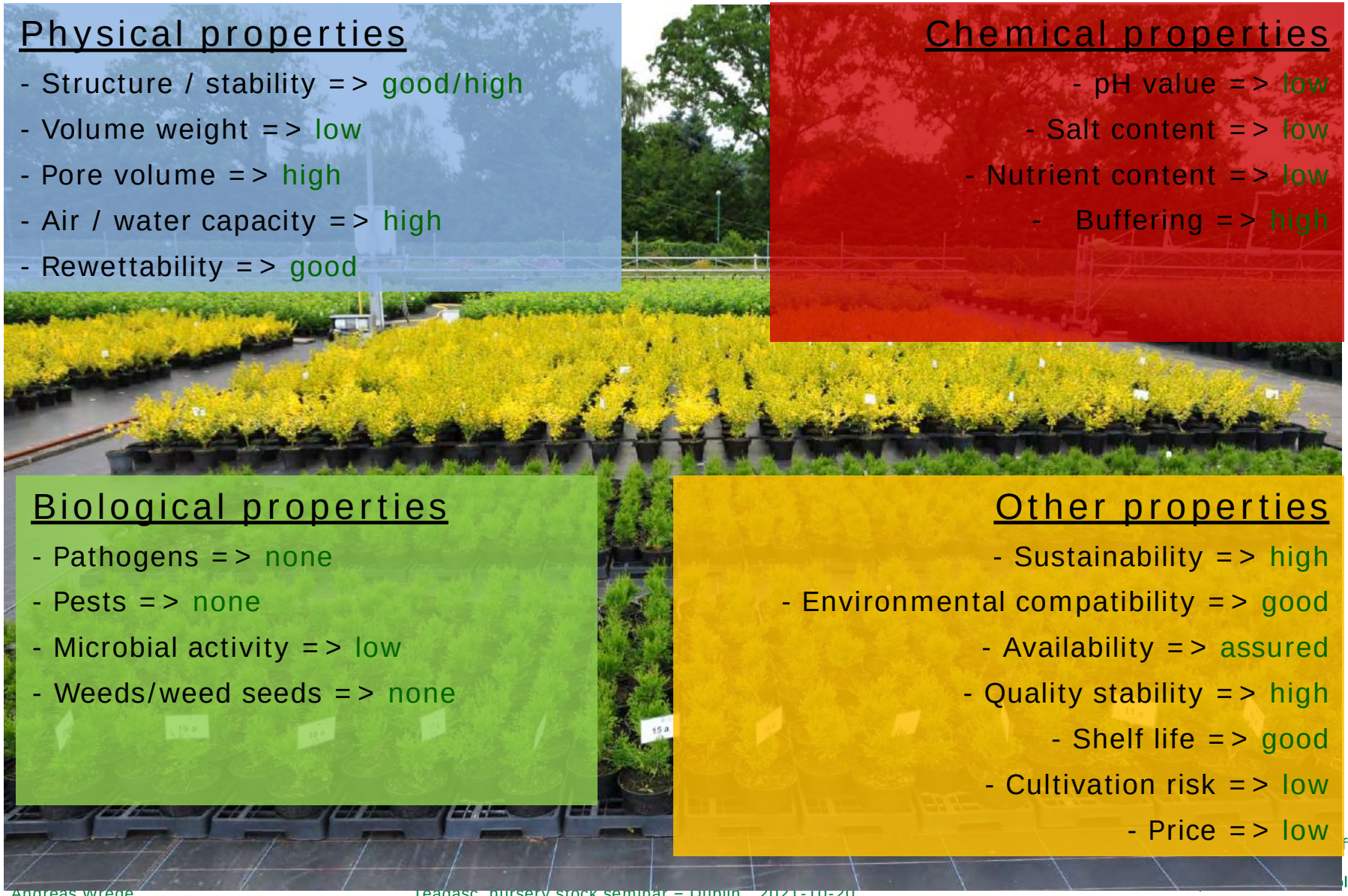
1. Properties of an "ideal" growing medium for horticulture

Physical properties

- Structure / stability => good/high
- Volume weight => low
- Pore volume => high
- Air / water capacity => high
- Rewettability => good

Chemical properties

- pH value => low
- Salt content => low
- Nutrient content => low
- Buffering => high



Biological properties

- Pathogens => none
- Pests => none
- Microbial activity => low
- Weeds/weed seeds => none

Other properties

- Sustainability => high
- Environmental compatibility => good
- Availability => assured
- Quality stability => high
- Shelf life => good
- Cultivation risk => low
- Price => low

1. Properties of an "ideal" growing medium for horticulture

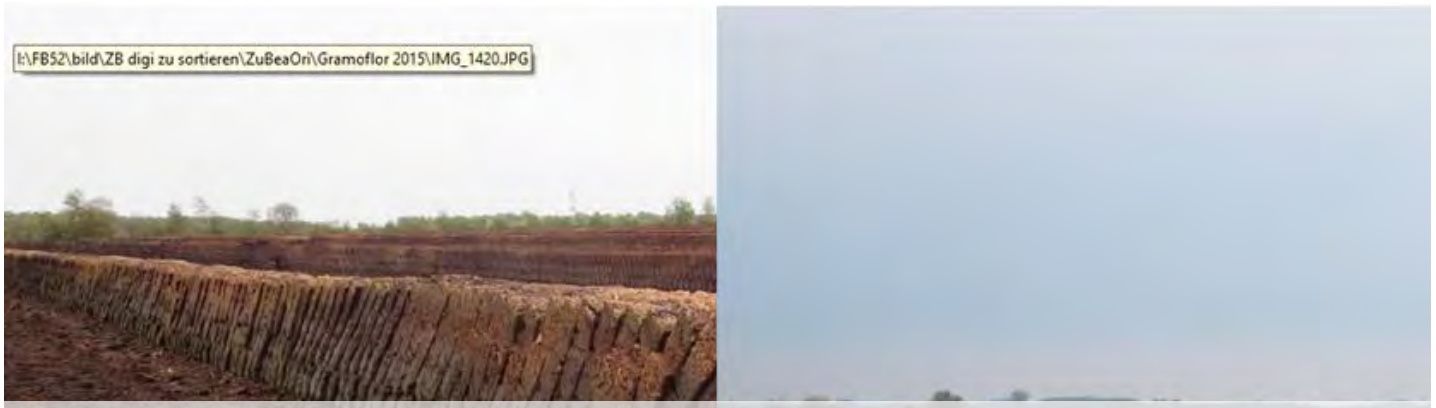
Peat fulfills most of these requirements for an "ideal" growing medium

- ✓ From the point of view of production technology, the only things that are usually criticized are its low buffering capacity and poor rewettability
- ✓ The properties of compost, wood fiber, coco & coir, on the other hand, deviate from the requirements of the "ideal" growing medium in many more points

=> The German government's peat reduction strategy and in particular a possible peat ban are therefore viewed rather skeptically by most players in the horticultural sector

II. Regulations for peat reduction in Germany

2. Why should horticulture save peat in the future?



- ✓ Although peatland soils make up only about 3% of the world's land surface, they store about 450 to 500 Gtons (gigaton = 1 000 000 000 tons) of carbon in the form of peat (about 1/3 of the carbon stored in soils worldwide)

- ✓ Approximately 560 Gtons of carbon is currently stored in all land plants combined Globally.

- ✓ It is estimated that growing peatlands (moorlands) store about 150 - 250 million tons of CO2 annually as peat, but this just offsets their simultaneous methane (CH4)

(Methane is also a climate-damaging gas, with at least a stronger short-term effect than CO_2)

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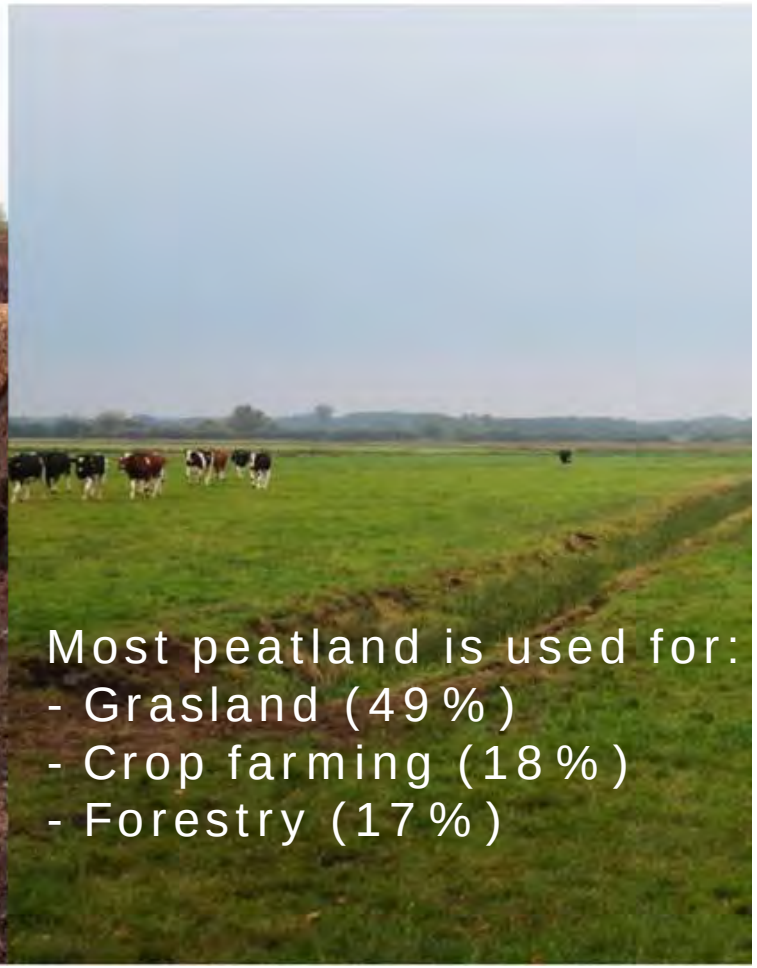
II. Regulations for peat reduction in Germany

2. Why should horticulture save peat in the future?



But no one talks about agriculture, because their lobby is very strong (!!!!),.....

....much, much,..... stronger than the very small lobby of horticulture

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II. Regulations for peat reduction in Germany

3. What does peat reduction strategy in D require from horticulture?

here particularly important for horticulture

Peat reduction strategy

In the peat reduction strategy, the policy calls for

- ✓ Peat cutting in Germany to be stopped in the long term (=> long term ?????)
- ✓ For hobby horticulture (for consumers), potting soils are to be peat-free by 2026 (=> no problems so far)
- ✓ For commercial horticulture, the aim is not to ban peat completely, but to replace it as far as possible by 2029 (=> as far as possible?? => 80%?? => more????)

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II. Regulations for peat reduction in Germany

3. What does peat reduction strategy in D require from horticulture?

- ✓ The Central Horticultural Association (ZVG) is currently offering the German government the opportunity to replace
  - 50 % of peat in growing media by 2025 and
  - 70 % of peat by 2030
- ✓ The ZVG speaks for all branches of horticulture, here especially for flower and ornamental plant growers (= floriculture), which mostly grow their plants in greenhouses
- ✓ The ZVG does not speak for the Association of German Tree Nurseries (BdB), whose members mainly cultivate in the open air (= not protected from the weather). Here, cultivation is mostly not in greenhouses, in larger containers and with much longer cultivation times of up to two growing seasons
- ✓ The demands on the physical properties of the growing medium (high air capacity, high structural stability and good drainage properties) are therefore much higher in tree nurseries than in floriculture. However, the physical properties in particular often get worse with increasing proportions of peat substitutes in growing media

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II. Regulations for peat reduction in Germany

3. What does peat reduction strategy in D require from horticulture?

- ✓ The BdB therefore assumes that a peat content in growing media for tree nurseries of no more than 50% will not be possible by 2025
- ✓ The BdB believes that the results of scientific projects on peat substitution in tree nurseries must first be awaited before binding decisions on peat substitution can be made
- ✓ Currently, the BdB considers a maximum peat content of 70% realistic (= 30% peat substitution) by 2025, but not 50%
- ✓ The target of 70% peat substitution in 2030 does not seem achievable at present. First, results from trials and from the nurseries themselves must be awaited
- ✓ But what the new federal government will really decide now is still completely open, especially since the Green Party will now also be in the government.....!!!!

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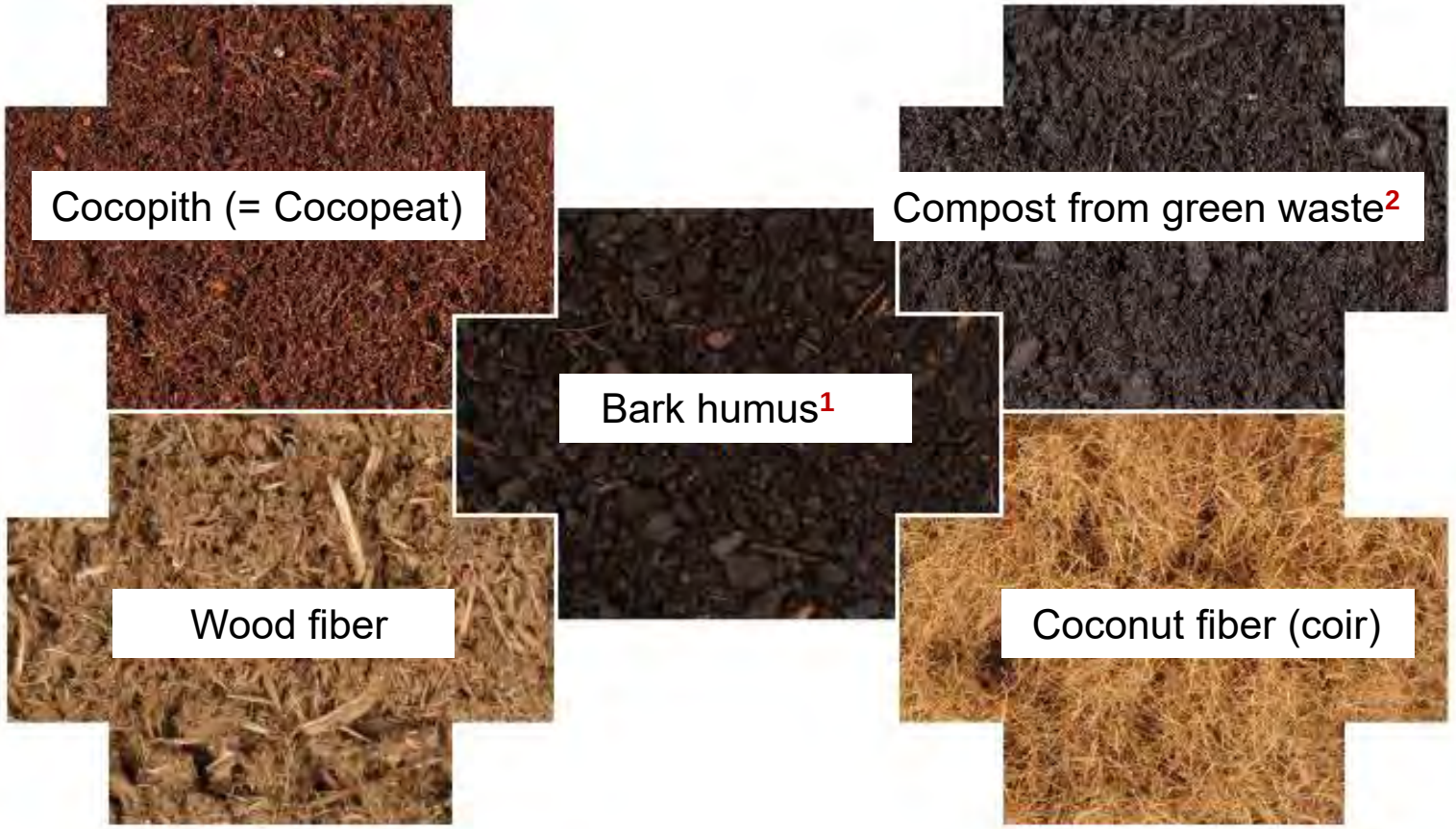
III. Results with peat substitutes in growing media for shrubs

1. Peat substitutes with potential to replace peat in larger amounts

- ✓ These five peat substitutes are currently seen as having the best potential for replacing peat in larger proportions



[1] = composted conifer bark; [2] = Composted waste from maintenance and pruning of woody plants from streets, parks and gardens

III. Results with peat substitutes in growing media for shrubs

1. Peat substitutes with potential to replace peat in larger amounts

✓ The replacement of 20 to 30 % peat in tree nursery growing media mostly works well with these five substitutes, if they are….:

- always from good quality
- always available in sufficient quantities => Covid 19!!
- their price is always good => bark humus =>Energy production
- their socio-economic evaluation is good => Cocos??
- their impact on climate change is low => CO_2-Foodprint => e.g. logistics of cocos and the production of wood fiber[1]

  [1] = Production under high pressure and temperatures

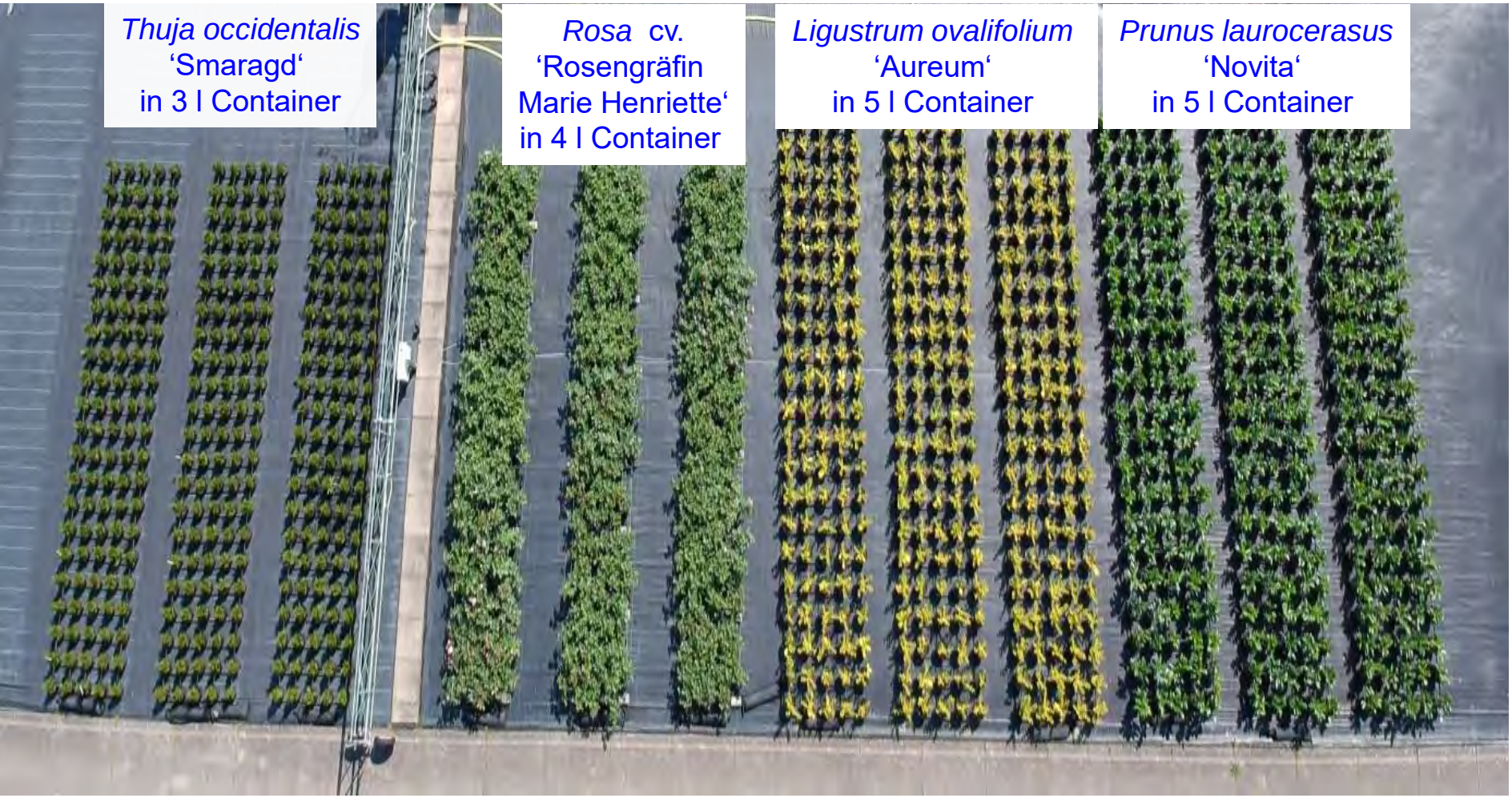
- …..

✓ In Germany, wood fiber and compost from green waste are likely to be the most successful under these conditions……., although cocopeat could replace peat best because of its almost ideal properties, as many experiments have already shown

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

The 2020 experiment from the bird's eye view



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III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

Overview of the substrate treatments tested in this trial

Var No.	Variant / treatment	
1	White peat substrate coarse 100% (growers practice)	= 0 % compost
2	White peat substrate coarse 80% / compost 20%	= 20 % compost
3	White peat substrate coarse 70% / compost 30%	= 30 % compost
4	White peat substrate coarse 60% / compost 40%	= 40 % compost
5	White peat substrate coarse 50% / compost 50%	= 50 % compost

✓ Fertilization: 4,0 kg/m³ Osmocote Exact Standard 8-9M
+ 150 g/m³ Micromax Premium (= trace elements)

=> mixed into the growing media before potting

✓ Potting: took place on April 06 + 07, 2020. The trial was set up with 3 replications of 20 plants each

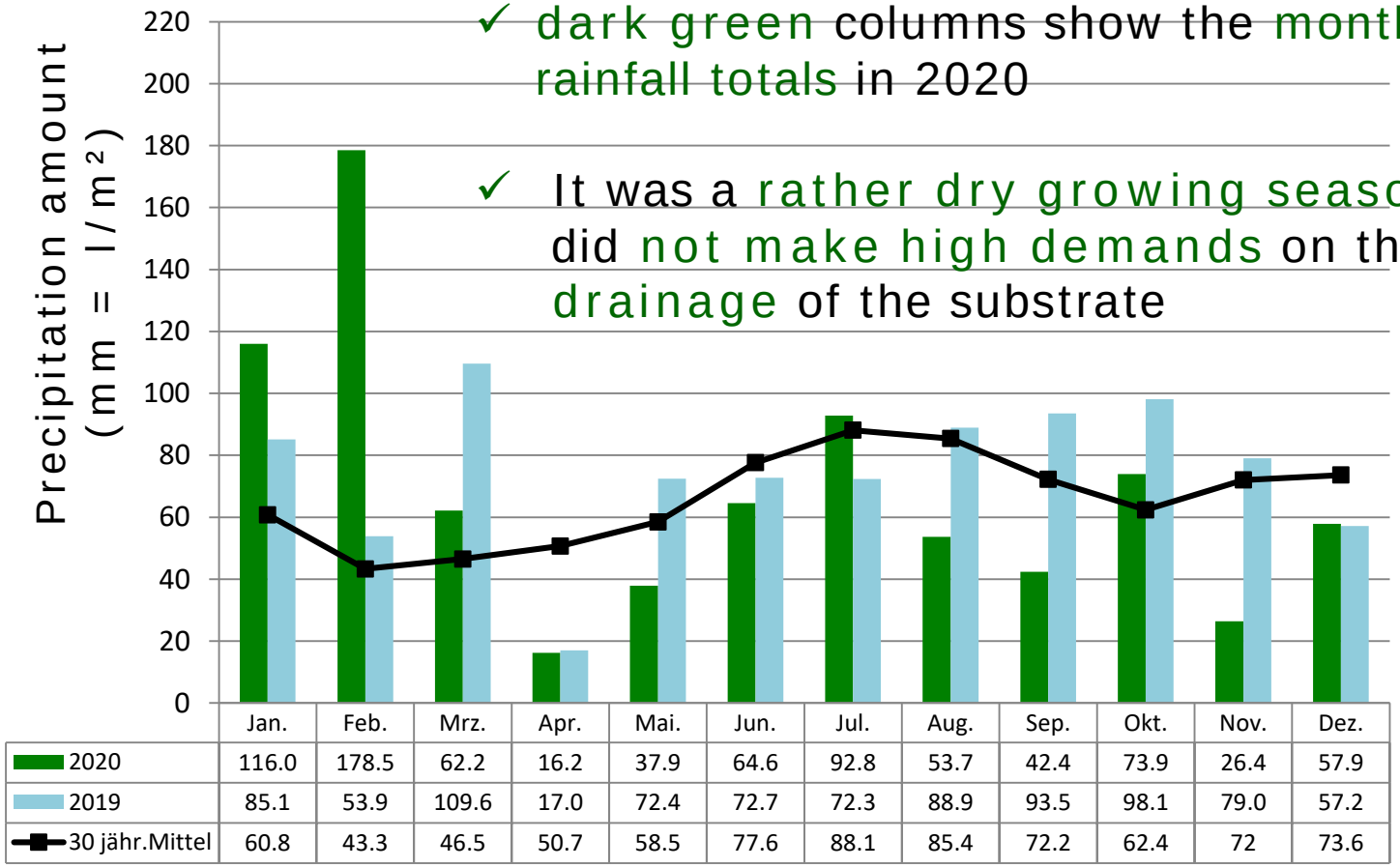
III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

III. Results with peat substitutes in growing media for shrubs

2. Results from Experiments with green waste compost

Monthly precipitation amount (mm = l/m²) in Ellerhoop, North Germany



	Jan.	Feb.	Mrz.	Apr.	Mai.	Jun.	Jul.	Aug.	Sep.	Okt.	Nov.	Dez.
2020	116.0	178.5	62.2	16.2	37.9	64.6	92.8	53.7	42.4	73.9	26.4	57.9
2019	85.1	53.9	109.6	17.0	72.4	72.7	72.3	88.9	93.5	98.1	79.0	57.2
30 jähr.Mittel	60.8	43.3	46.5	50.7	58.5	77.6	88.1	85.4	72.2	62.4	72	73.6

- ✓ dark green columns show the monthly rainfall totals in 2020
- ✓ It was a rather dry growing season, which did not make high demands on the drainage of the substrate

III. Results with peat substitutes in growing media for shrubs

2. Results from Experiments with green waste compost

- ✓ The trial was finished for the roses at the time of their full blooming (= time of sale) in mid-June 2020
- ✓ For the other three woody plants, the trial continued until mid-October
- ✓ In the process of evaluation the following parameters were measured
  - Shoot length (cm)
  - Shoot fresh weight (g)
  - Quality grading (Percentage of plants in the different quality (size) classes

III. Results with peat substitutes in growing media for shrubs

2. Results from 2xperiments with green waste compost

a. Results with roses

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III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

a. Results with roses

20% compost

30% compost

100% peat

40% compost

50% compost

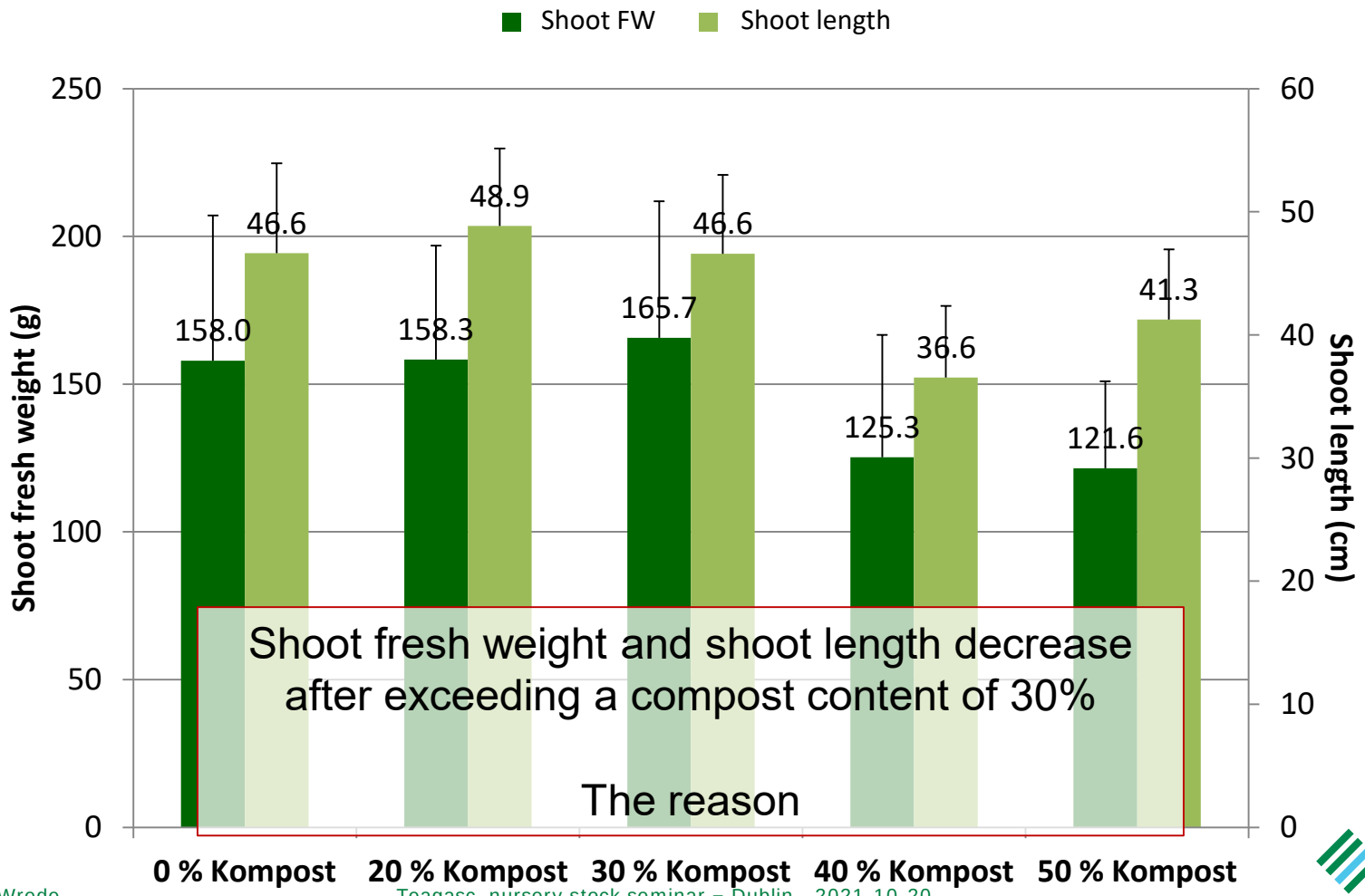
later blooming
and
plants remained
smaller

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

a. Results with roses

Mean shoot fresh weight (Shoot FW) and shoot length of roses depending on the compost content



Shoot fresh weight and shoot length decrease after exceeding a compost content of 30%

The reason

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

b. Results with *Prunus laurocerasus* **'Novita'** (cherry laurel)

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

b. Results with *Prunus laurocerasus* **'Novita'** (cherry laurel)

100% peat

20% compost

30% compost

40% compost

50% compost

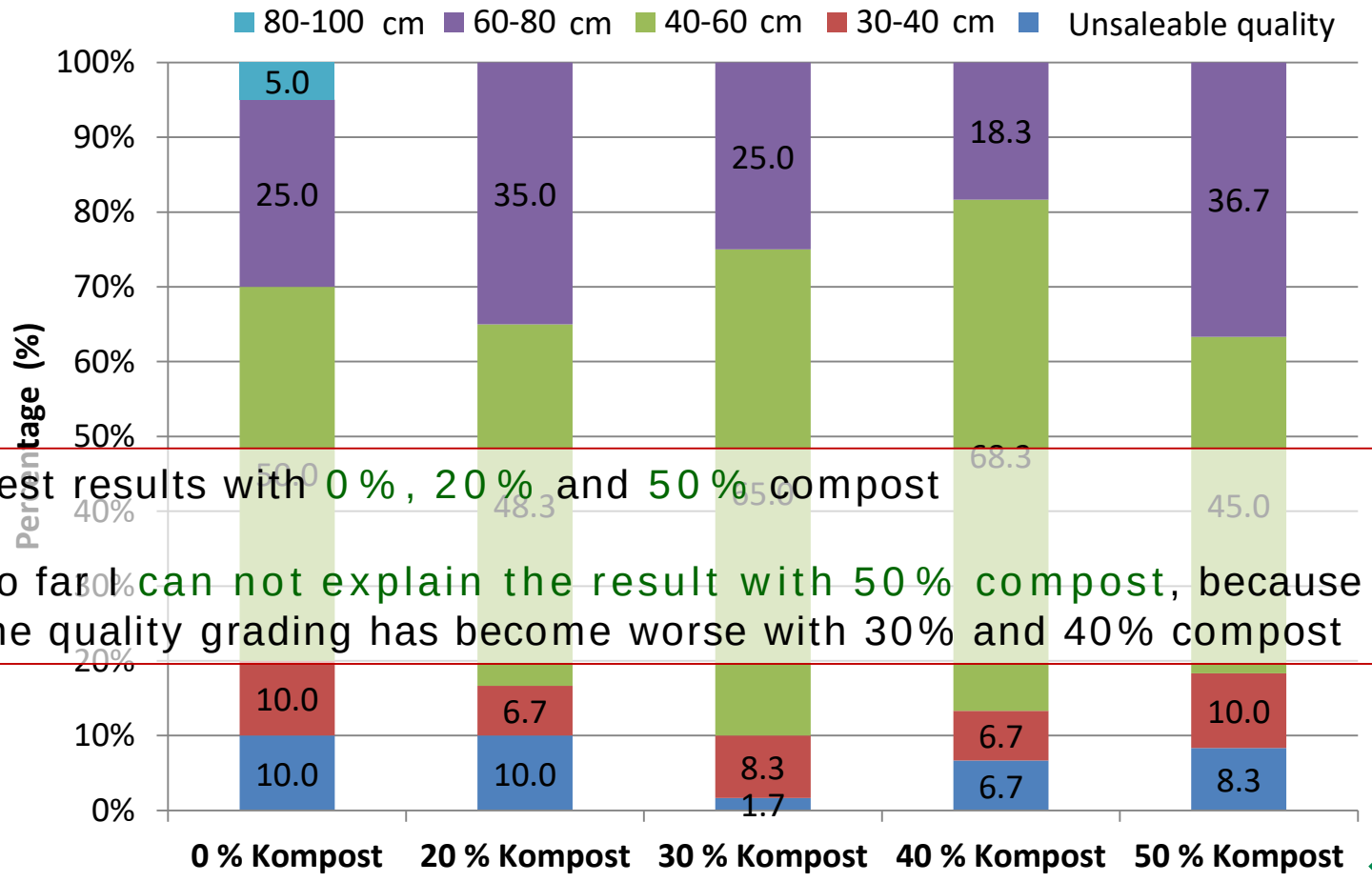
Visually, there were hardly any differences between the plants of the different treatments

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

b. Results with *Prunus laurocerasus* **'Novita'** (cherry laurel)

Percentage of Cherry Laurels in the different quality classes depending on the compost content



Best results with 0 %, 20 % and 50 % compost

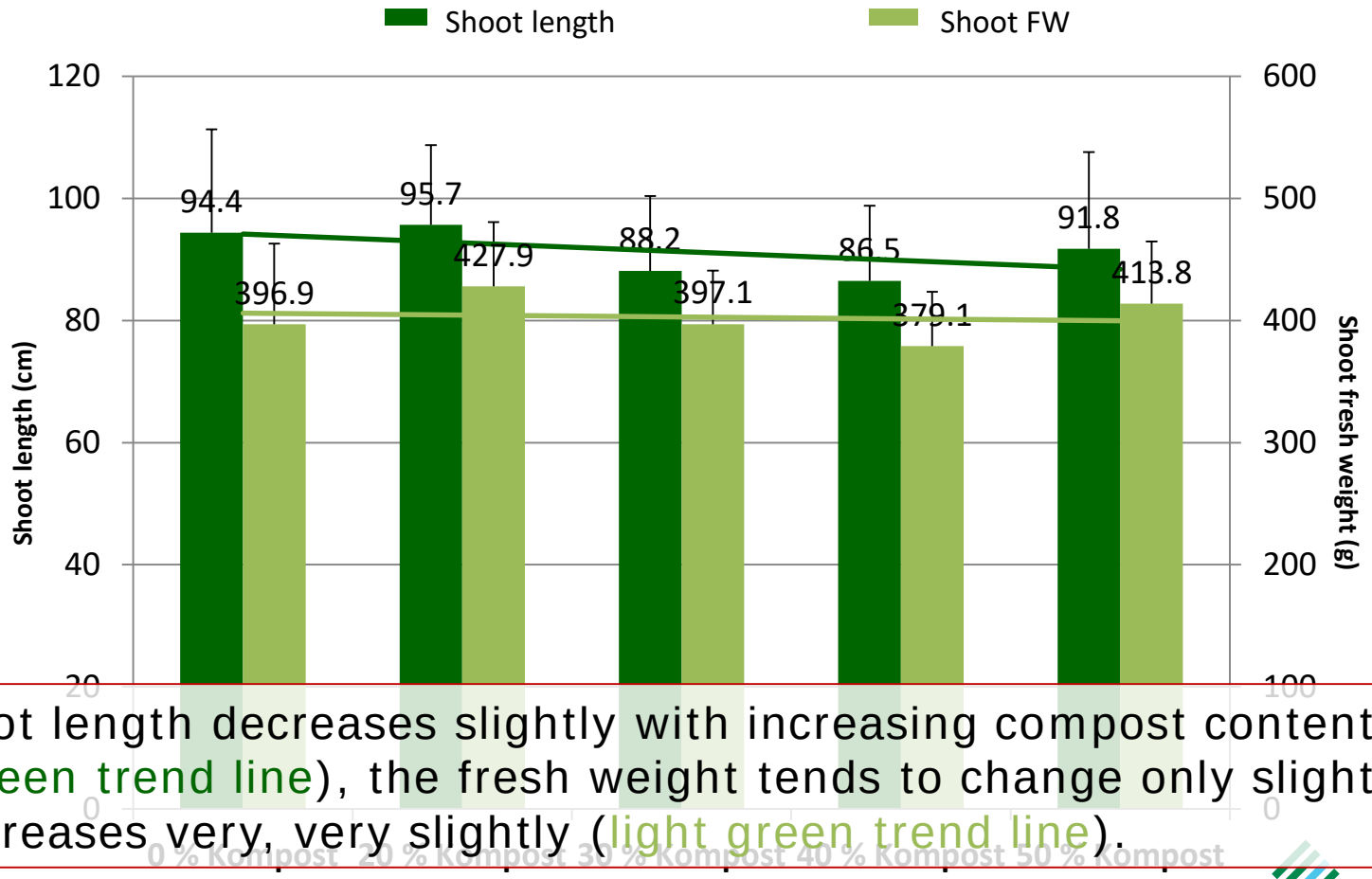
So far I can not explain the result with 50 % compost, because the quality grading has become worse with 30% and 40% compost

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

2. Results with *Prunus laurocerasus* **'Novita'** (cherry laurel)

Mean shoot fresh weight (Shoot FW) and shoot length of cherry laurel depending on the compost content



The shoot length decreases slightly with increasing compost content (dark green trend line), the fresh weight tends to change only slightly, even increases very, very slightly (light green trend line).

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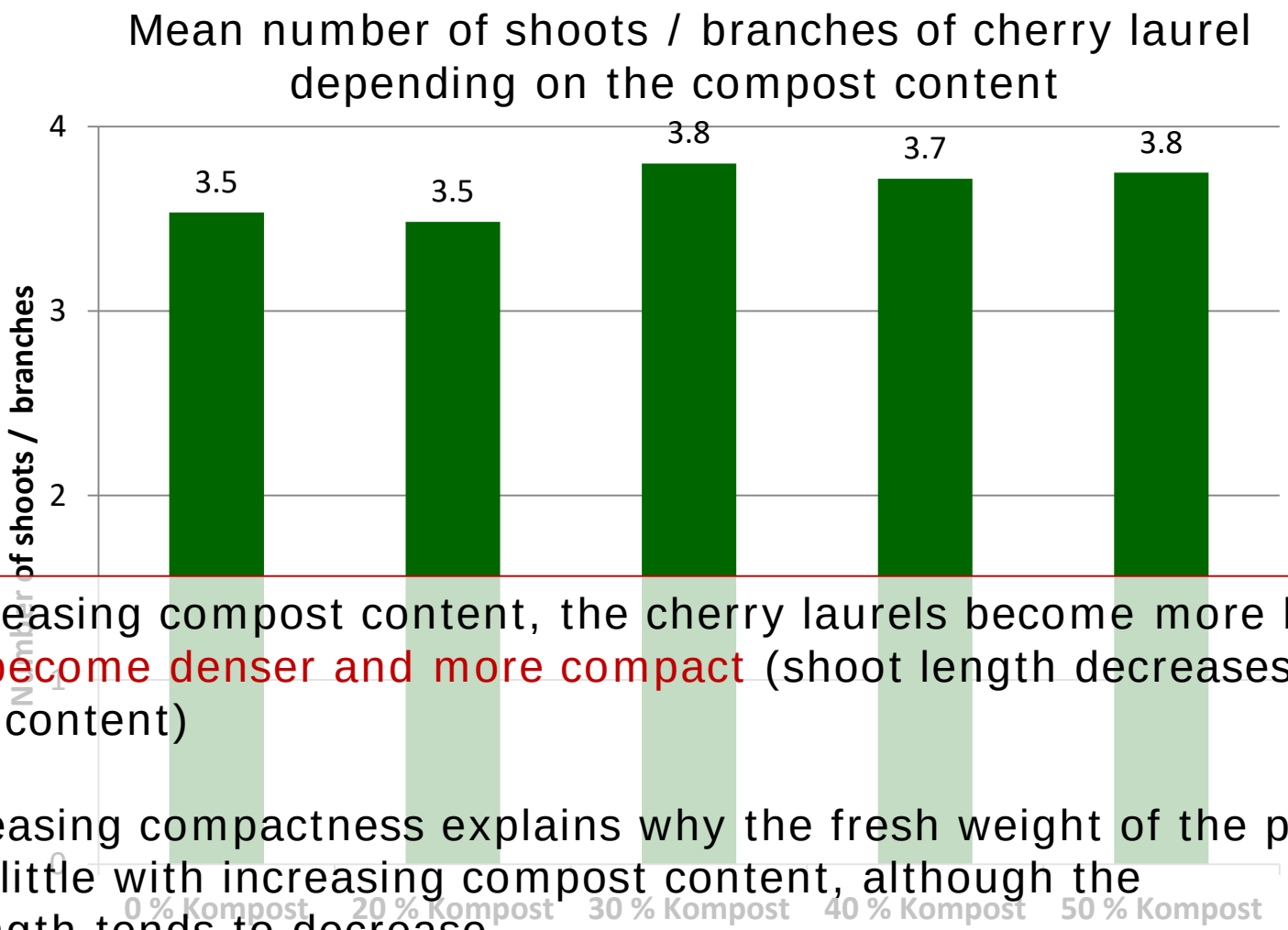
III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

b. Results with *Prunus laurocerasus* **'Novita'** (cherry laurel)



With increasing compost content, the cherry laurels become more branched, so they become denser and more compact (shoot length decreases with compost content)

The increasing compactness explains why the fresh weight of the plants changes little with increasing compost content, although the shoot length tends to decrease

III. Results with peat substitutes in growing media for shrubs

2. Results from 2xperiments with green waste compost

c. Results with *Thuja occidentalis* 'Smaragd' (**Emerald** green cedar)

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

c. Results with *Thuja occidentalis* 'Smaragd' (**Emerald** green cedar)

20% compost

100% peat

30% compost

40% compost

50% compost

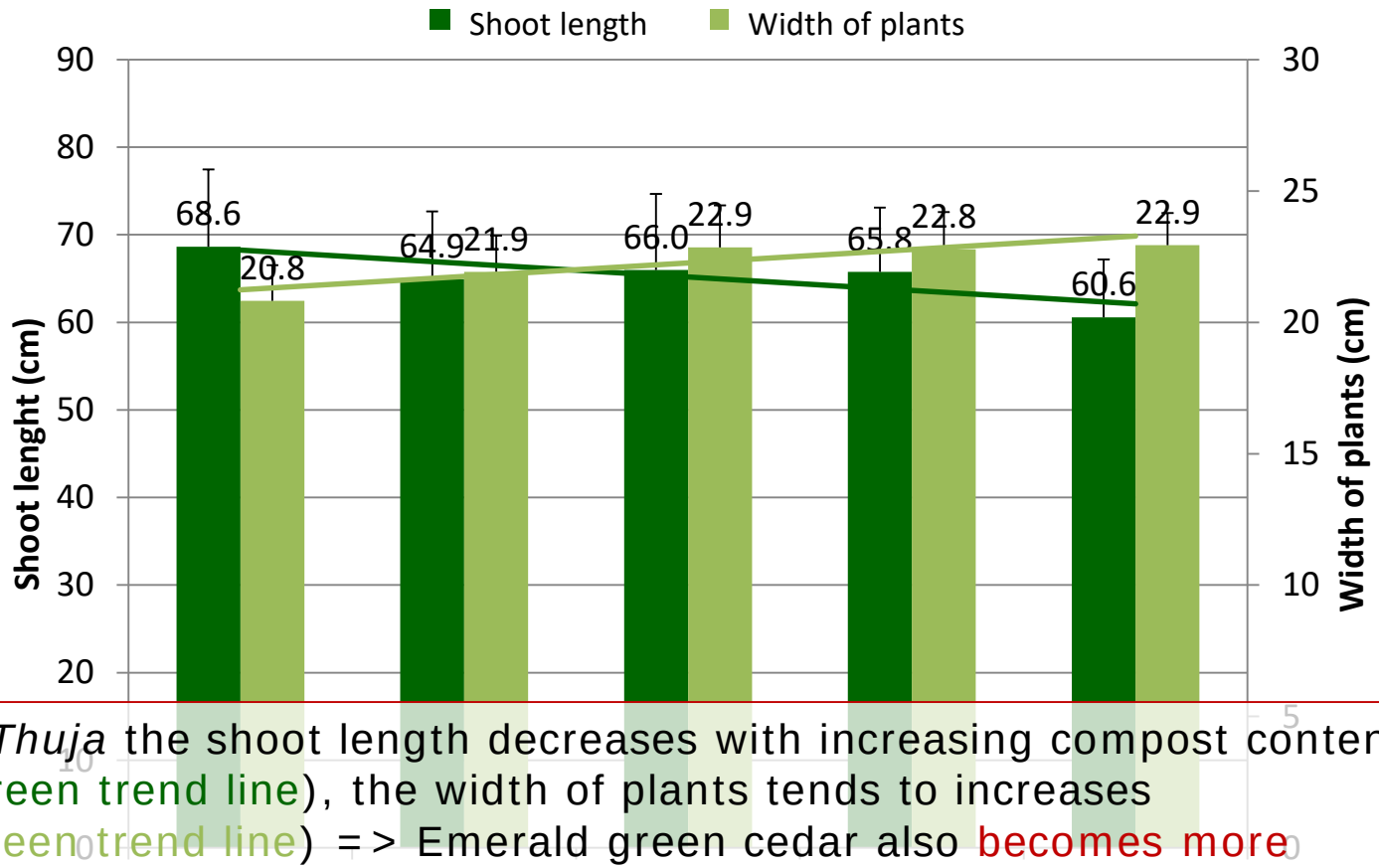
Visually, there were hardly any differences between the plants of the different treatments…
…. maybe the also become more compact?

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

c. Results with *Thuja occidentalis* 'Smaragd' (**Emerald** green cedar)

Mean shoot fresh weight (Shoot FW) and width of the plants
(= diameter at the base of the shoot) depending on the compost content



Also in *Thuja* the shoot length decreases with increasing compost content (dark green trend line), the width of plants tends to increases (light green trend line) => Emerald green cedar also becomes more compact with increasing compost content, like we have seen for cherry laurels

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

d. Results with *Ligustrum ovalifolium* **'Aureum'(golden** privet)

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

c. Results with *Ligustrum ovalifolium* **'Aureum'(golden** privet)

20% compost

100% peat

30% compost

40% compost

50% compost

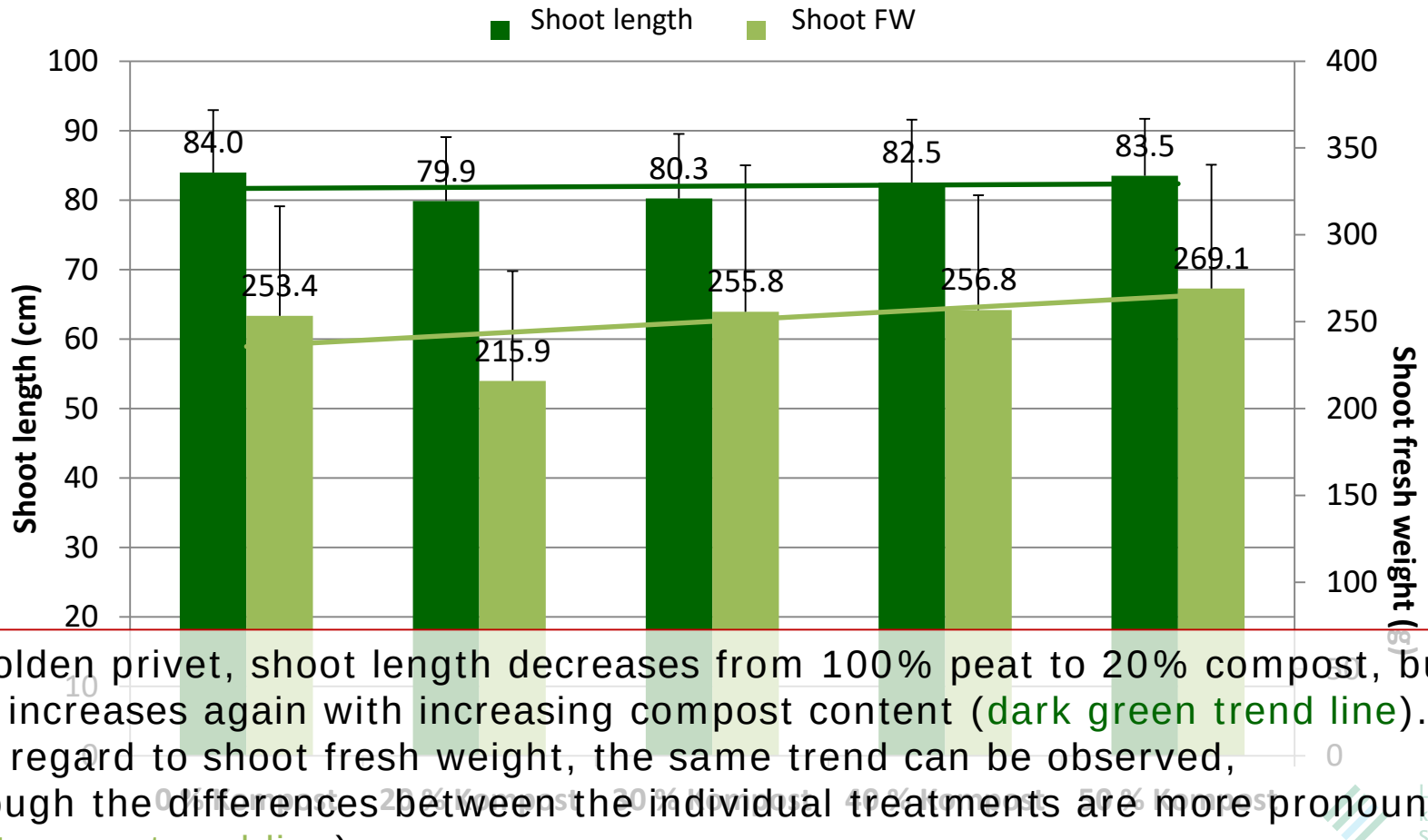
Is golden privet also getting shorter and more compact with increasing compost content?????

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

d. Results with *Ligustrum ovalifolium* **'Aureum'(golden** privet)

Mean shoot fresh weight (Shoot FW) and shoot length of cherry laurel depending on the compost content



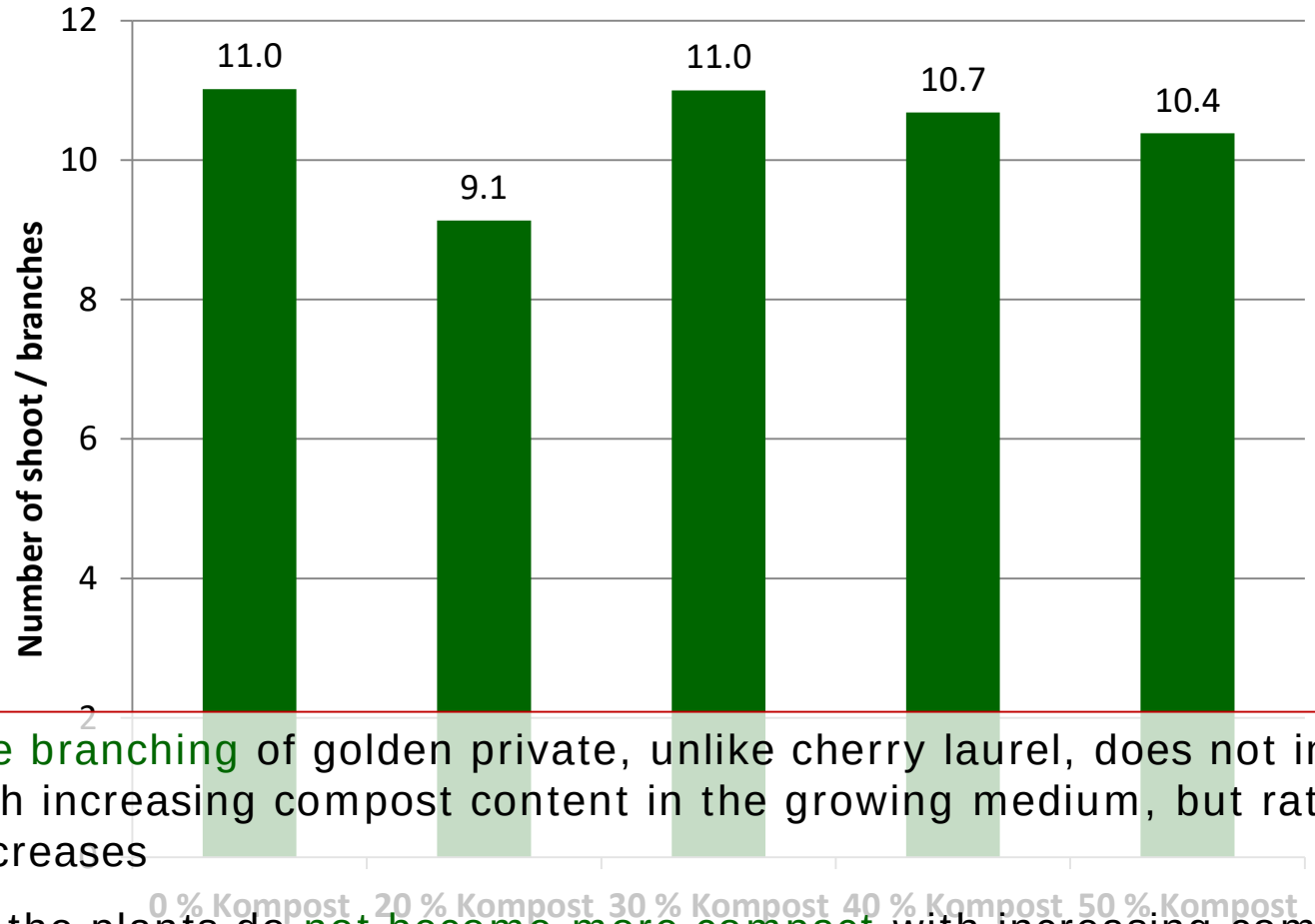
In Golden privet, shoot length decreases from 100% peat to 20% compost, but then increases again with increasing compost content (dark green trend line). With regard to shoot fresh weight, the same trend can be observed, although the differences between the individual treatments are more pronounced (light green trend line)

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

d. Results with *Ligustrum ovalifolium* **'Aureum'(golden** privet)

Mean number of shoots / branches of golden privet depending on the compost content



- ✓ The branching of golden private, unlike cherry laurel, does not increase with increasing compost content in the growing medium, but rather decreases
- ✓ So the plants do not become more compact with increasing compost content

III. Results with peat substitutes in growing media for shrubs

2. Results from experiments with green waste compost

e. Summary

- ✓ It was possible to *produce good and merchantable plants of high quality* with all four experimental plants in *all five substrate treatments*

- ✓ The result could have been *different with a wet, rainy summer*, as it would then have depended on the *drainage of the substrate*

- ✓ With increasing compost content
  - the roses bloomed later and showed reduced growth as soon as the content of 30% compost in the substrate was exceeded (salt stress, since potted bare rooted)
  - the shoot length of the cherry laurel and Thuja was smaller with simultaneously increasing branching or increasing diameter of the shoot (more compact plants)

- ✓ With golden private the fresh weight and the length of the shoot of 100% peat on 20% compost reduced very clearly, before it with further rising compost portion again increased (explanation???)

- ✓ An addition of 30% compost was justifiable under the conditions of this trial (except for privet). For *Thuja* and cherry laurel, 40% and possibly 50% would have been acceptable (in 2020!!!)

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III. Results with peat substitutes in growing media for shrubs

2. Results from Experiments with green waste compost

e. Summary

- ✓ The only problem is that the quality grading is mostly done *primarily according to the shoot length* of the plants, which, however, tended to decrease with increasing compost content

III. Results with peat substitutes in growing media for shrubs

3. Results from experiments with different substitutes

- ✓ On behalf of the Ministry of Agriculture, we have been carrying out a project since end of 2020 to promote peat reduction in tree nurseries
- ✓ ToSBa = Model and demonstration project for the practical introduction of peat-reduced substrates in tree nurseries

- ✓ For this purpose, five leading companies have been selected for which we will further reduce the peat content of their current standard growing medium over the next four years and use increasing quantities of peat substitutes
- ✓ The growing media will be developed together with the substrate suppliers of the individual nurseries, the nurseries themselves and us (Amount and type of peat substitutes and in which and in which number of plants)
- ✓ Here are some the first observations


KORDES
JUNGPFLANZEN


HEYDORN
SÖHNE


HEINZCLASEN
CONTAINERBAUMSCHULEN


CLASEN&CO

III. Results with peat substitutes in growing media for shrubs

3. Results from experiments with different substitutes

Copper beech (*Fagus sylvatica* for hedges) grown in 5 l Container

75% peat	50% peat	40% peat
15% wood fibre	20% wood fibre	20% wood fibre
10% Expanded clay	20% green waste compost	30% green waste compost
	10% Expanded clay	10% Expanded clay

III. Results with peat substitutes in growing media for shrubs

3. Results from experiments with different substitutes

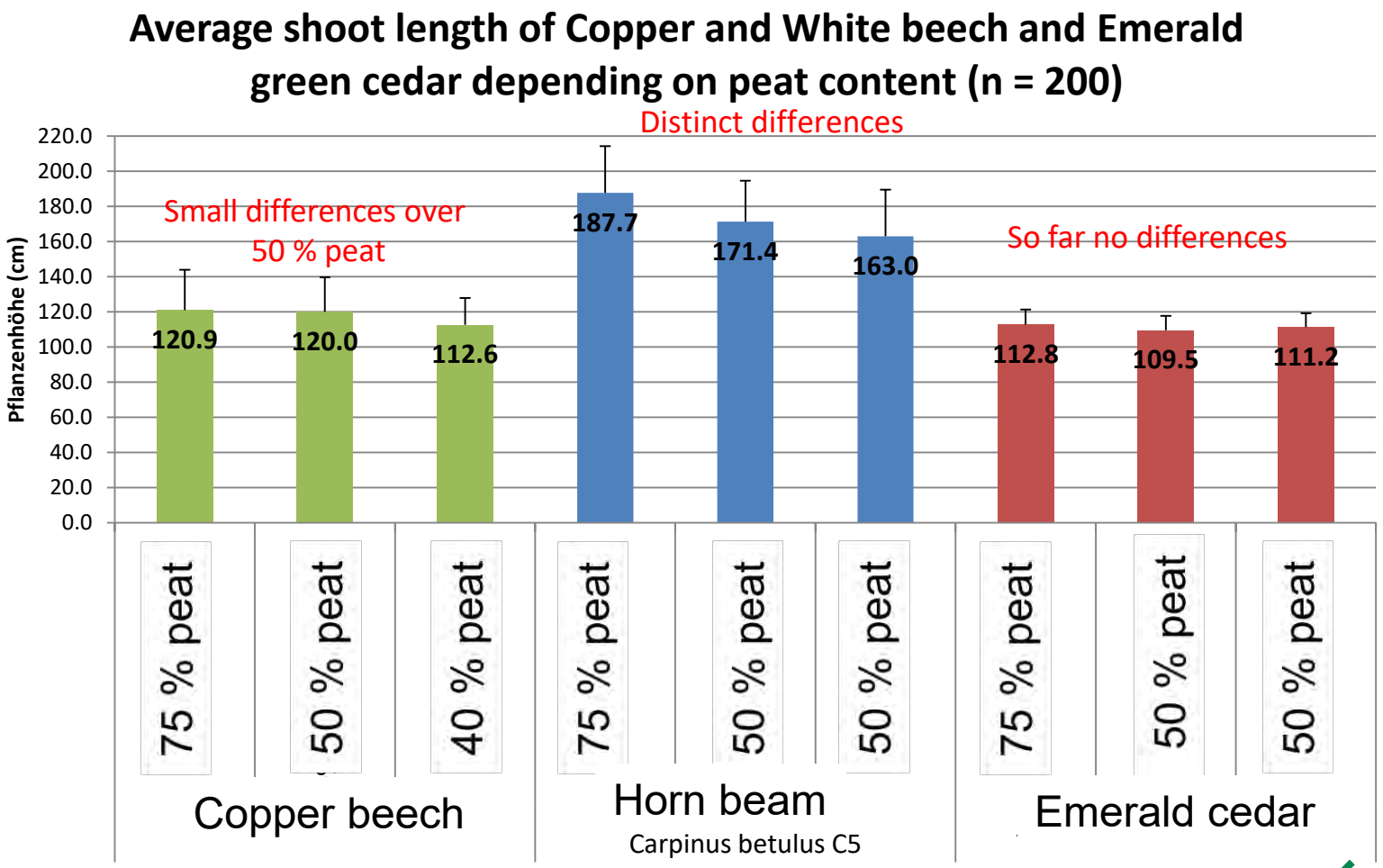
Hornbeam (*Carpinus betulus* for hedges) grown in 5 l Container

The reason for the somewhat poorer growth of the beech trees in the media with a very high peat substitute content may be the poorer drainage of the media due to the high compost content (30% and 40%), as the summer in northern Germany was rather wet

III. Results with peat substitutes in growing media for shrubs

3. Results from Experiments with different subtitutes

Copper beech (*Fagus sylvatica* for hedges) grown in 5 l Container



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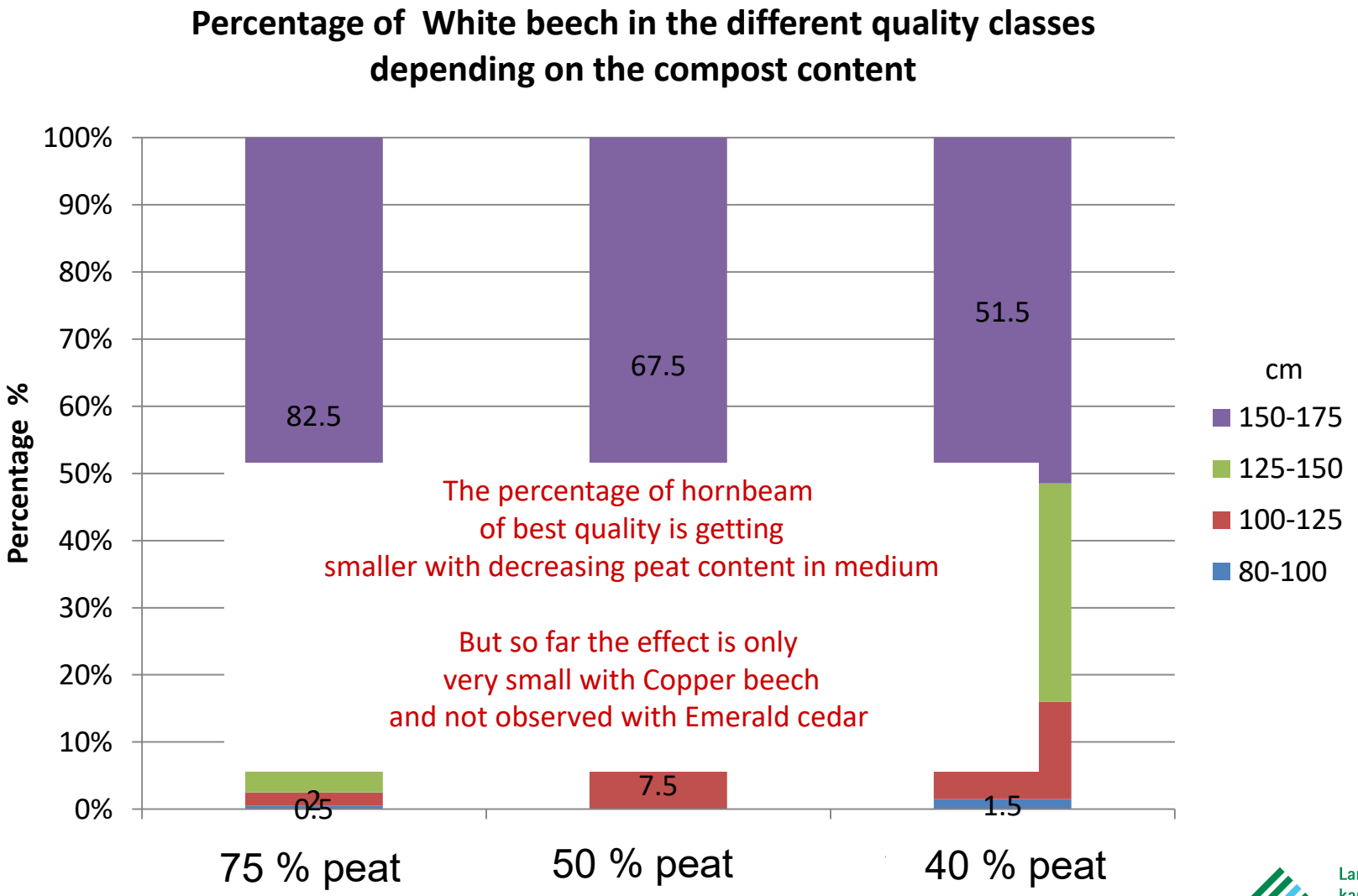
III. Results with peat substitutes in growing media for shrubs

3. Results from experiments with different substitutes



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Seit 1887
KORDES ROSEN
Die schönsten Rosen der Welt

IV. Organic fertilization compared to mineral fertilization

IV. Organic fertilization compared to mineral fertilization

Experimental question: Is it possible to replace mineral fertilisers with organic fertiliser?

IV. Organic fertilization compared to mineral fertilization

1. Background

Current background:

- ✓ Growing sections of society and politics demand sustainable action from industry and consumers
- ✓ Increasingly, the production of woody plants and other ornamen plants is also coming under public criticism
- ✓ The use of mineral fertilizers has long been criticized, whet justified or not
- ✓ The use of coated depot fertilizers is increasingly affected by negative discussion about microplastics

https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/nachhaltigkeit-in-der-politik

IV. Organic fertilization compared to mineral fertilization

1. Background

- ✓ Coated depot fertilizers are usually coated with a (pure) plastic (Synthetic resin) shell, e.g.

Nutricote T70
(completely coated; Arysta Life Science)

Haifa Topdress 4-5M
(partially coated; HAIFA)

IV. Organic fertilization compared to mineral fertilization

1. Background

- ✓ According to the producer ICL-SF, Osmocote Pro and [illegible] are surrounded by a biodegradable shell of soy [illegible] x. 0.1 mm thick, but the hardener used makes it [illegible]dable in the sense of the European Plastics Stra[illegible]equires 90% degradability of the shell with[illegible]ter the end of the specified service life (as of 2026)

To date, no coated fertilizer meets the requirements of the European Plastics Strategy

Osmocote Exact Standard 8-9M
(completely coated, ICL-SF)

IV. Organic fertilization compared to mineral fertilization

1. Background

- ✓ In this context, it seems to make sense to look again at the use of organic fertilizers in the cultivation of woody plants in containers

- ✓ Since the use of peat is also discussed negatively, as already presented at the beginning, the trial was carried out in peat-reduced medium, in which 50% of the peat was replaced by coco fiber and wood fiber

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

1. growers practice in Schleswig-Holstein => Osmocote Pro

✓ Basic fertilization with

Osmocote Pro 5-6M

NPK 19-9-10

✓ Top dressing with

NPK 22-5-10

only for weaker consuming plants

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Schleswig-Holstein

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

2. CUXIN-DCM (after exact agreement with CUXIN company)

✓ Basic fertilization with

NPK 8-5-6

NPK 13-0-0

NPK 2,5-1-4 + *Bacillus* sp.

✓ Top dressing with

NPK 9-5-3

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Schleswig-Holstein

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

3. HAUERT-Biorga (after exact agreement with HAUERT company)

✓ Basic fertilization with

ORGANOS NPK 9,5-2-4

VIANOS NPK 9-9,5-0

✓ Top dressing with

ORGANOS NPK 9,5-2-4

Landwirtschafts-kammer Schleswig-Holstein

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

4. PROVITA-Baumschuldünger (after exact agreement with BECKMANN & BREHM company)

✓ Basic fertilization and also top dressing with

NPK 7-2-5

✓ *New product*, not yet on the market at that time. However, it was *introduced to the market in 2021* after the successful test with us

Landwirtschafts-kammer Schleswig-Holstein

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

Fertilization target: *approx.750 mg N/ l growing medium*

Since the *organic fertilizers must first be converted by microorganisms* and therefore the *nitrogen is not immediately available* (or is partly fixed), *200 mg N/l more was given* here than with the coated mineral comparison fertilizer Osmocote Pro => *organic fertilization Target 950 mg N/l*

	Basic fertilization (mixed into growing medium in g/l)		1. Top dressing (on surface of pot/medium in g/l)		2. Top dressing (on surface of pot/medium in g/l)	
high-consumption crops (less sensitive to salt)						
	Product	**g/l**	**Product**	**g/l**	**Product**	**g/l**
1	-Osmocote Pro 5-6M	4,0	---	---	---	---
2	-DCM Eco-Xtra 1 -DCM horn chippings (coarse meal) -DCM Vivisol	5,0 1,5 1,5	-DCM Eco-Mix 1 (Beginning July)	3,6	---	---
3	-Biorga Organos -Biorga Vianos	3,2 2,0	-Biorga Organos (Beginning July)	5,0	---	---
4	-Provita Baumschuldünger	7,0	-Provita Baumschuldünger (Beginning July)	6,6	---	---
Less demanding crops (somewhat more sensitive to salt)						
	Product	**g/l**	**Product**	**g/l**	**Product**	**g/l**
5	-Osmocote Pro 5-6M	2,0	-OsmoTop (Beginning July)	1,7	---	---
6	-DCM Eco-Xtra 1 -DCM horn chipping (coarse meal) -DCM Vivisol	3,0 1,0 1,5	-DCM Eco-Mix 1 (Mid June)	3,0	-DCM Eco-Mix 1 (Mid July)	3,0
7	-Biorga Organos -Biorga Vianos	2,0 1,5	-Biorga Organos (Mid June)	3,5	-Biorga Organos (Mid July)	3,0
8	-Provita Baumschuldünger	4,5	-Provita Baumschuldünger (Mid June)	4,5	-Provita Baumschuldünger (Mid July)	4,5

IV. Organic fertilization compared to mineral fertilization

2. Experimental setup

high-consumption crops (less sensitive to salt)		Less demanding crops (somewhat more sensitive to salt)	
- *Prunus lauroc.* 'Novita'	Tb9 → C3	- *Ligustrum ovalif.* 'Aureum'	Tb9 → C3
- *Hypericum calycinum*	Tb9 → C3	- *Thuja occ.* 'Smaragd'	Tb9 → C2
- *Buxus sempervirens*	Tb9 → C2	- *Taxus* x *media* 'Hillii'	Tb9 → C2
- *Spiraea cinerea* 'Grefsheim'	QP96 → C3	- *Weigela* 'Bristol Ruby' sensitive to salt because bareroot at time of potting	bew. Sth. → C3 (= rooted hardwood cutting)

= Tb9 = Square pot approx. 9by9by10cm, approx. 0.5 liters

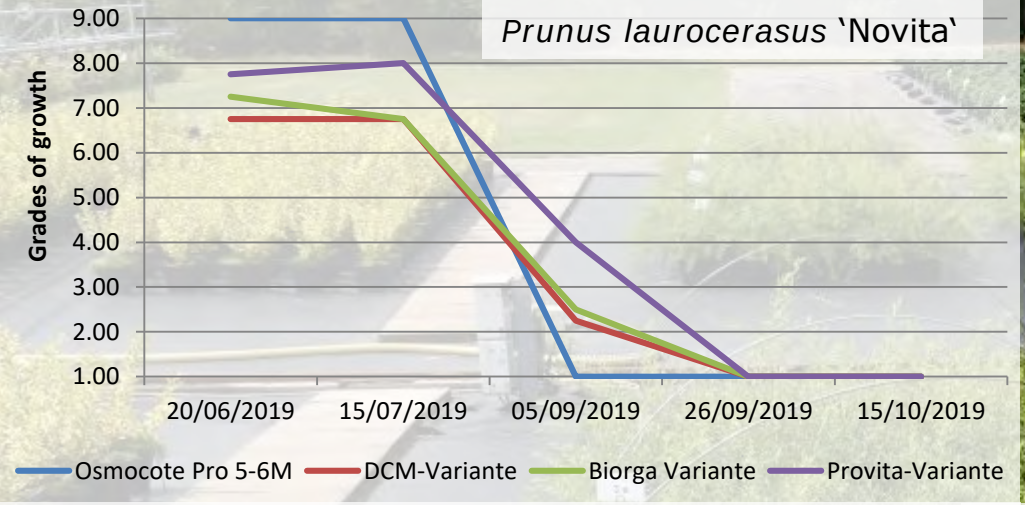
Potting date: Mid April 2020

Number of plants per fertilizer treatment: 4 repetitions of 25 plants each = 100 plants per treatment

IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

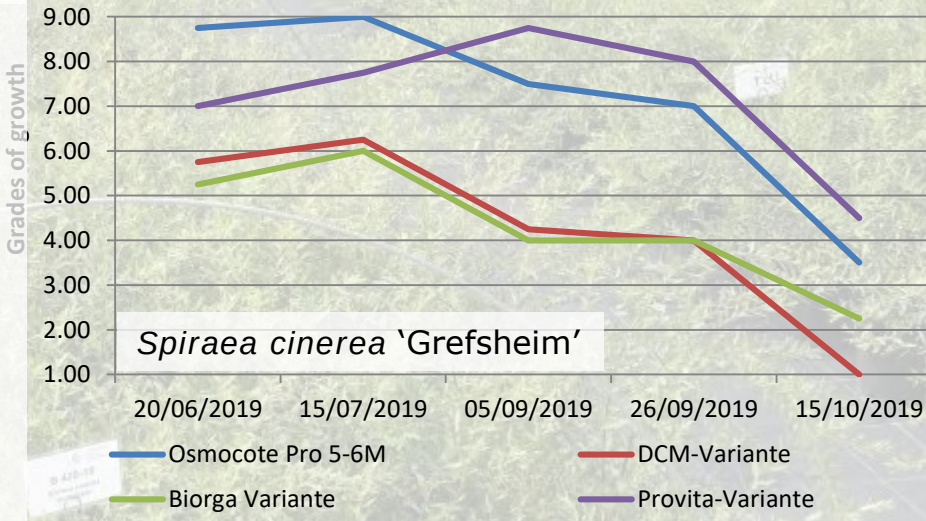
a. Growth during growing season



Grades for growth over the course of growing season

(1 = very poor; 3 = poor; 5 = medium
7 = good; 9 = very good)

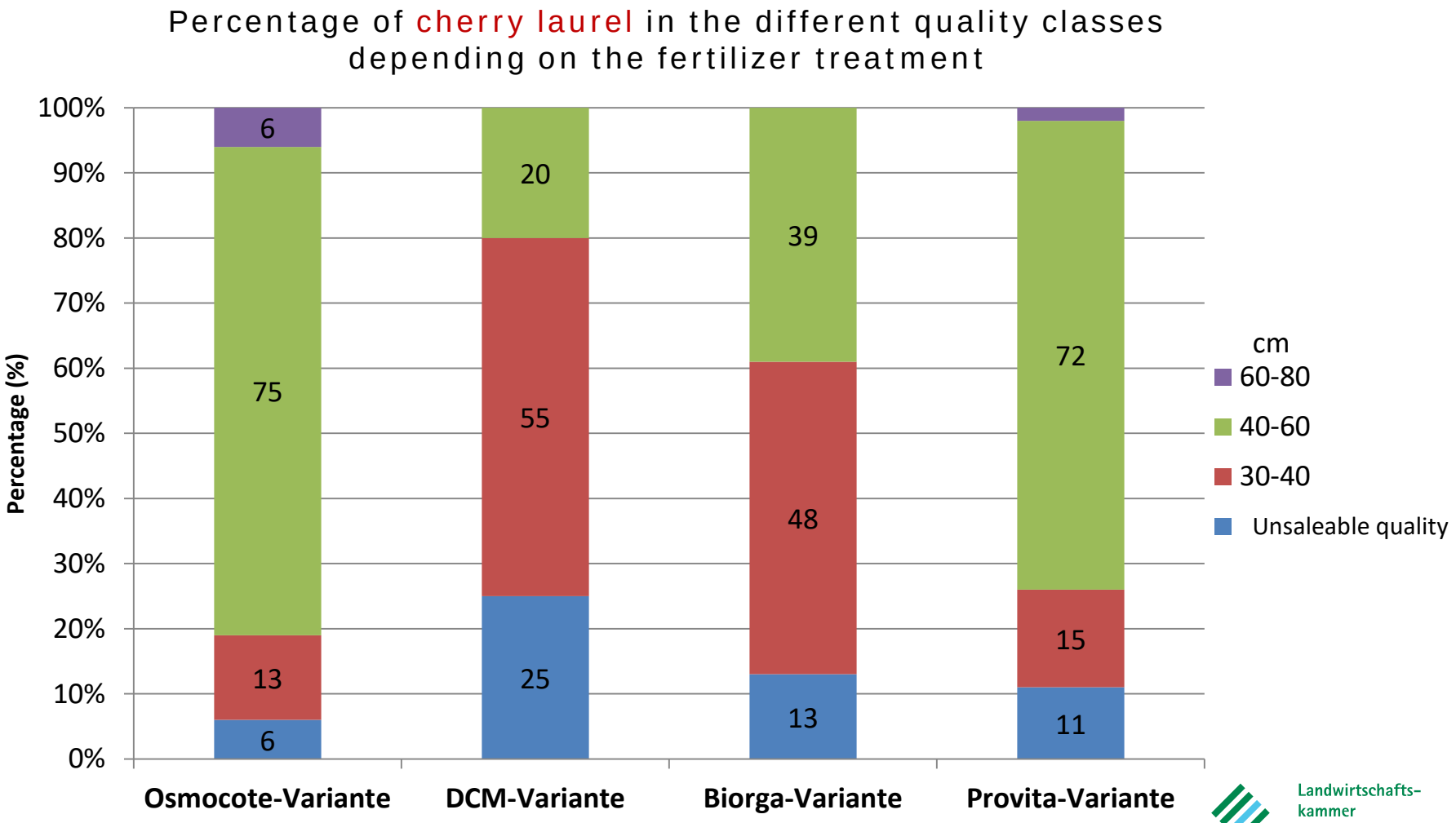
- ✓ For the *other* two high consuming crops, a *similar course* was observed
- ✓ Nurseries would also have reacted to Osmocote Pro with timely *top-dressing fertilization*, which we decided against (target of mineral fertilization = 750 mg N/l, no more).
- ✓ Does it make sense to change to 5-6M only at the *end of April* or *beginning of May* and not mid April (growers practice.



IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of season



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IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of season

Osmocote Pro - DCM

Osmocote Pro - BIORGA

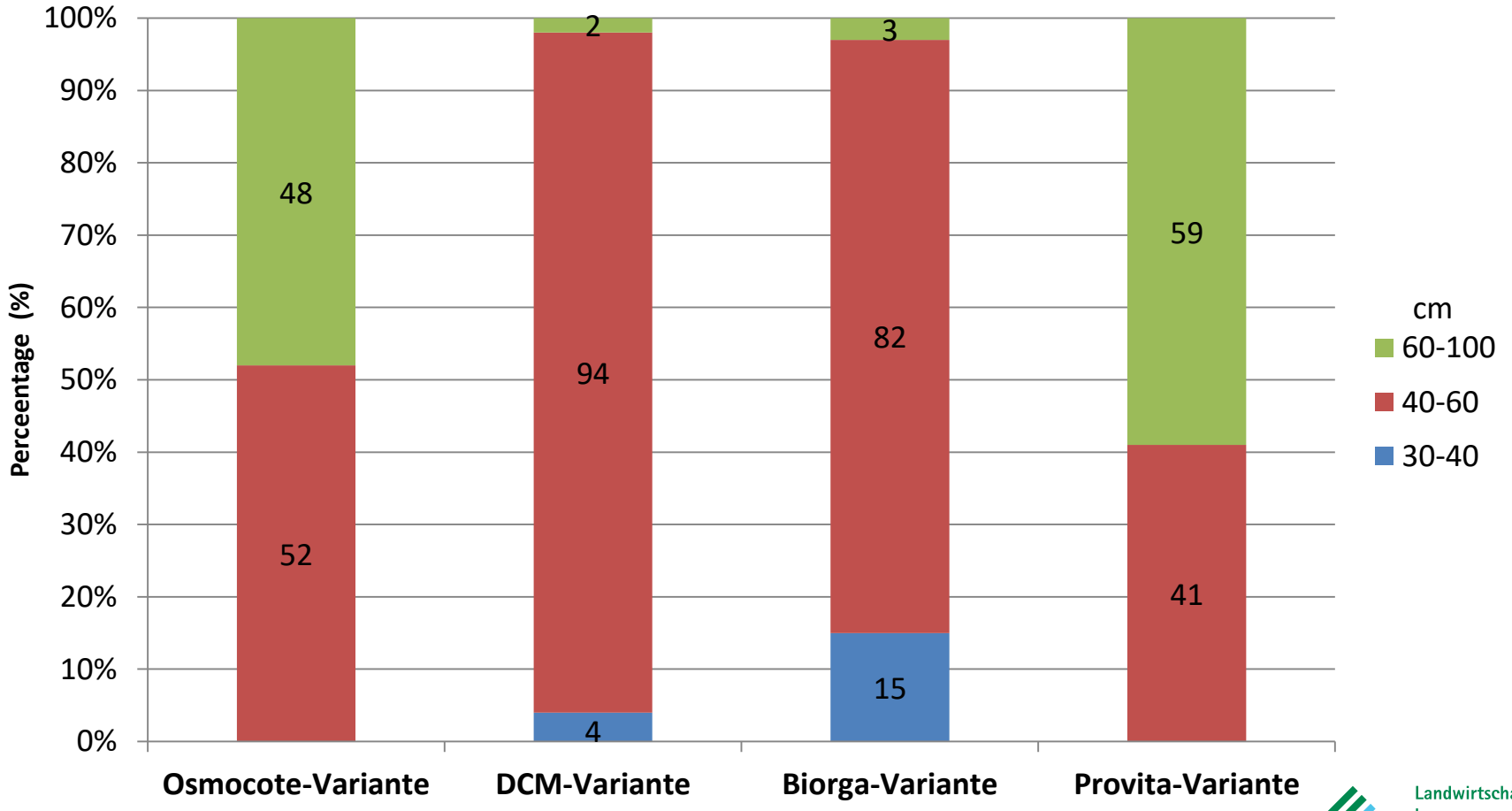
Osmocote Pro - PROVITA

IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of season

Percentage of *Spiraea* Grefsheim in the different quality classes depending on the fertilizer treatment



Landwirtschafts-kammer Schleswig-Holstein

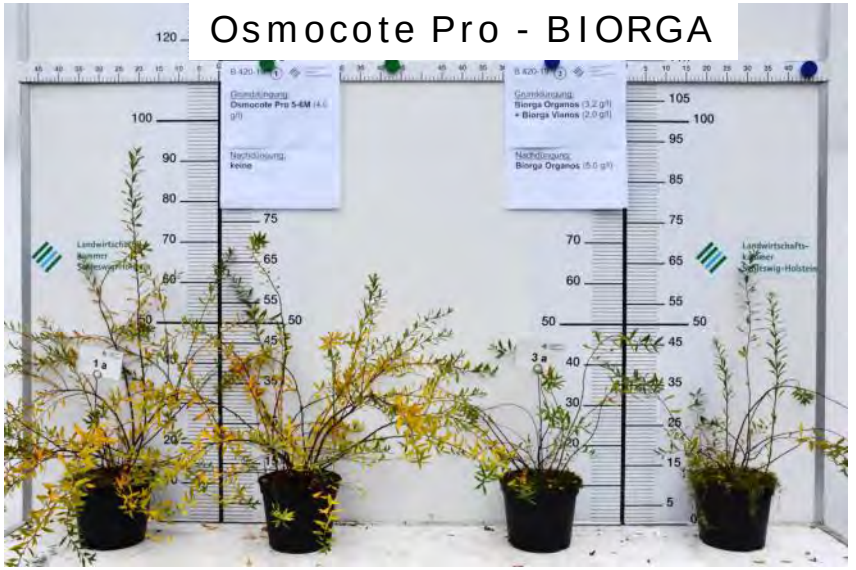
IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of the season

Osmocote Pro - DCM

Osmocote Pro - BIORGA



Osmocote Pro - PROVITA

IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

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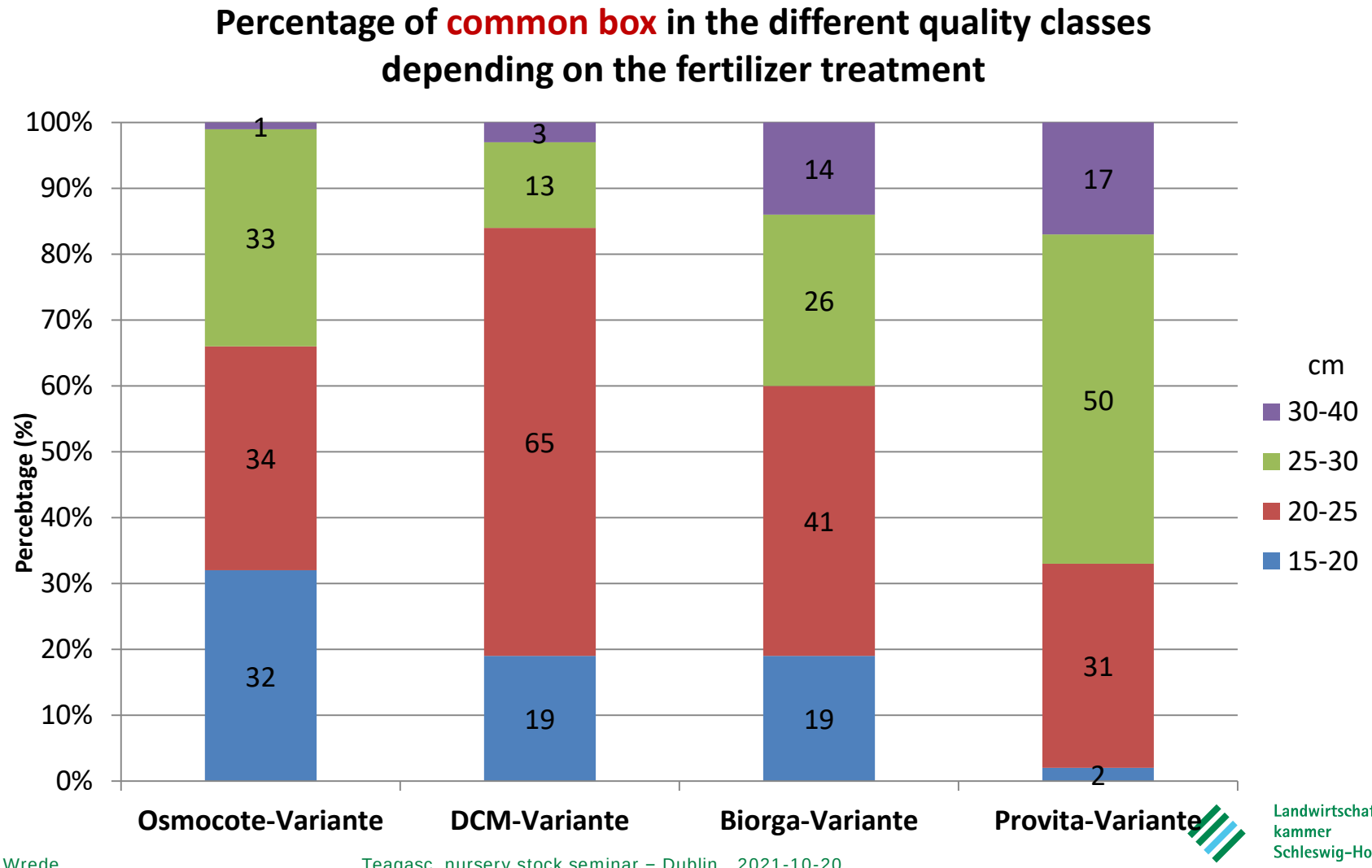

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IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

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Osmocote Pro - DCM

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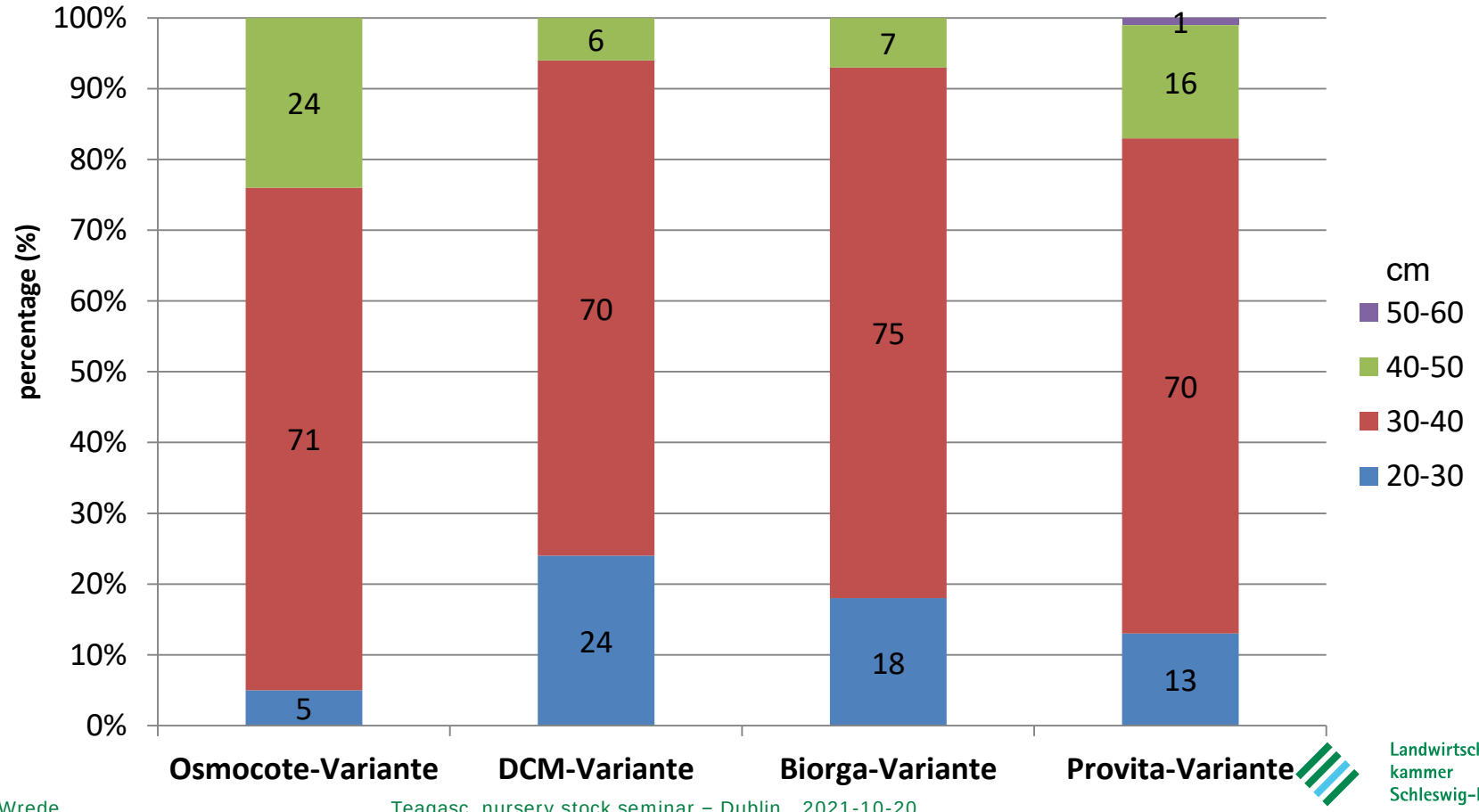
IV. Organic fertilization compared to mineral fertilization

3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of the season

Percentage of *Hypericum calycinum* (large-flowered St John's wort) in the different quality classes depending on the fertilizer treatment



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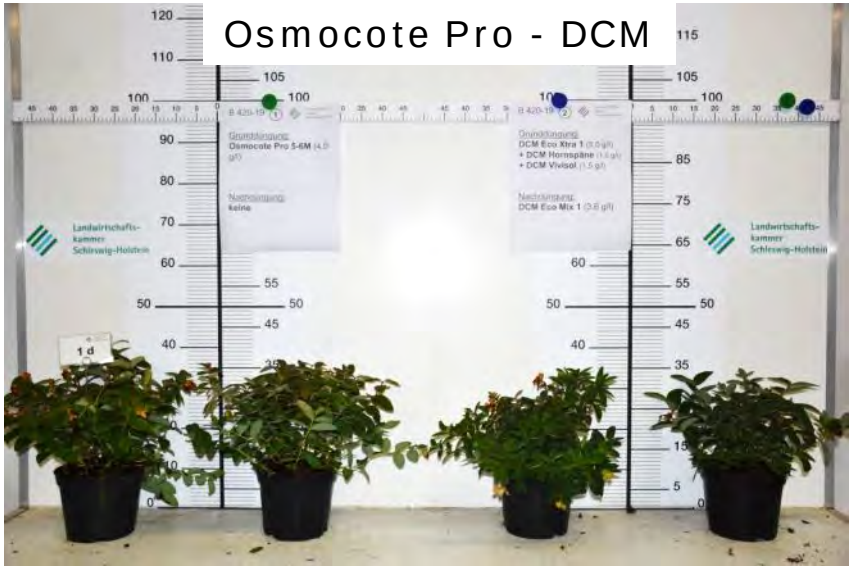
IV. Organic fertilization compared to mineral fertilization

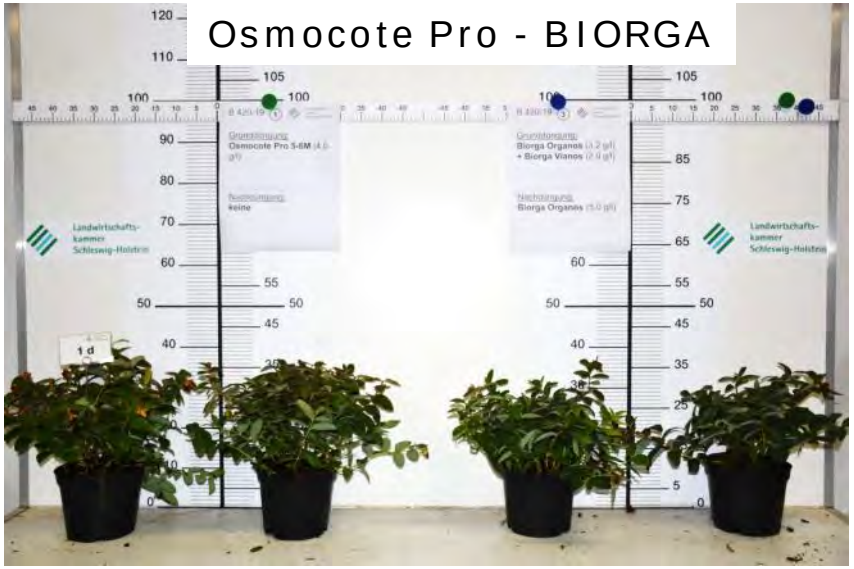
3. Results of high-consumption crops (less sensitive to salt)

b. Results at the end of the season

Osmocote Pro - DCM



Osmocote Pro - BIORGA

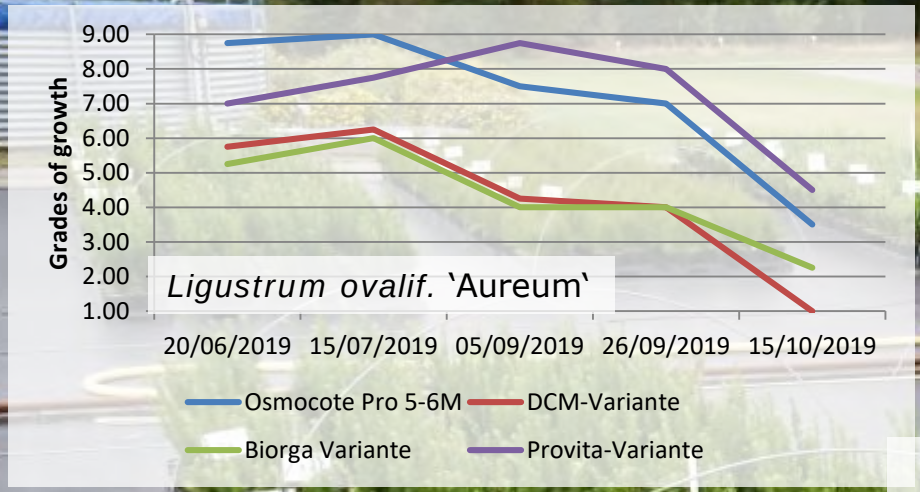


Osmocote Pro - PROVITA

IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

a. Growth during the growing season



Grades for growth over the course of growing season

(1 = very poor; 3 = poor; 5 = medium
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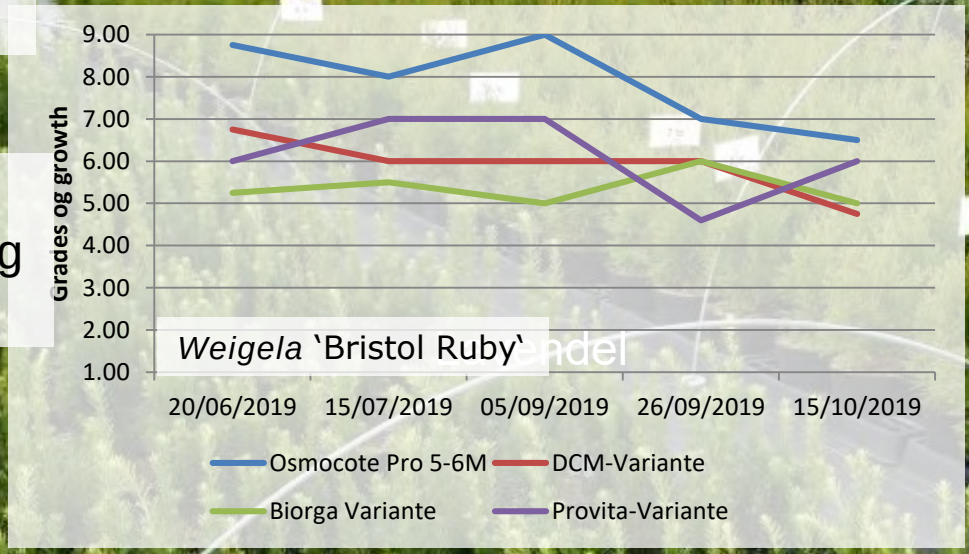
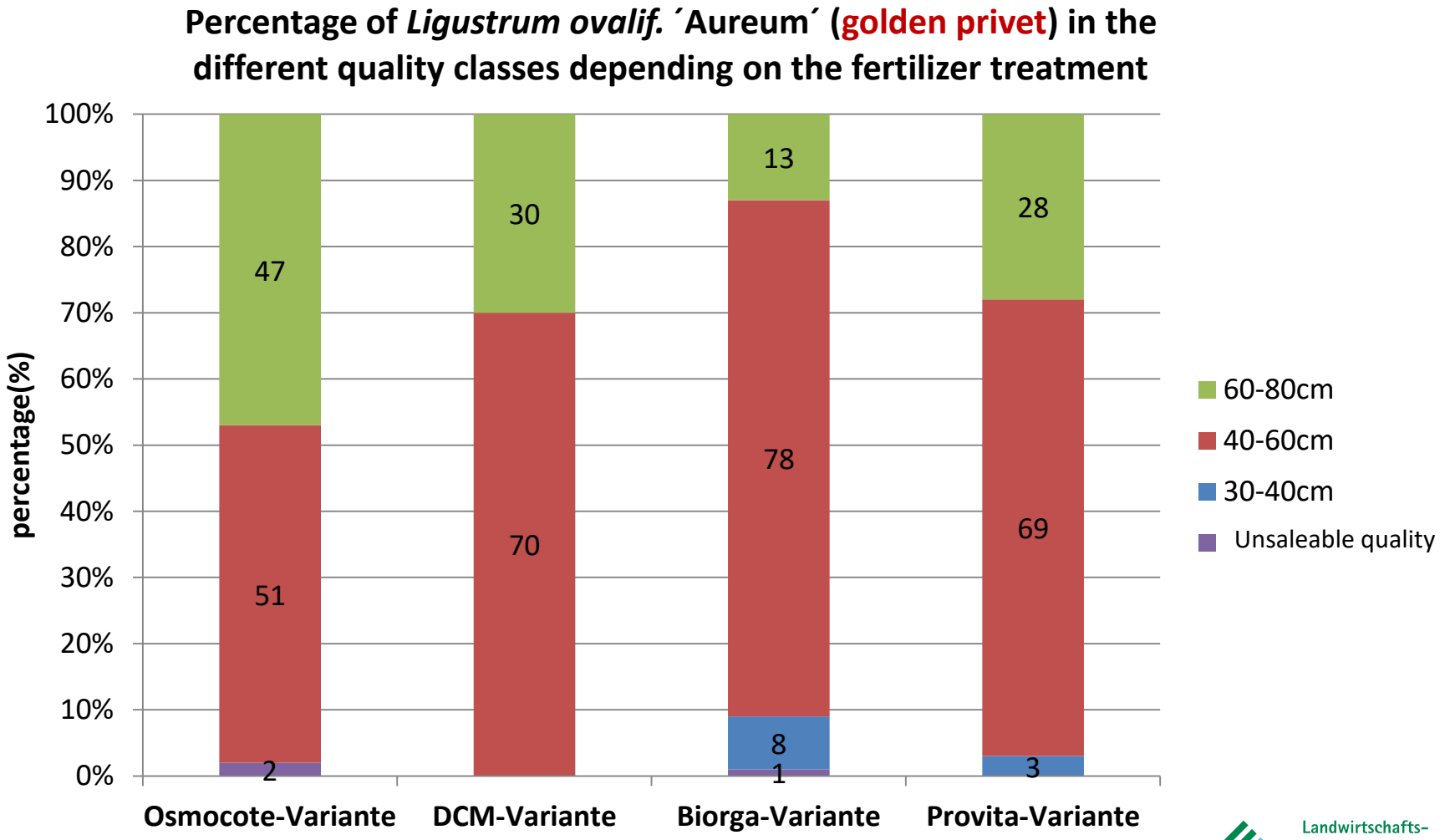


✓ A similar course was observed with the other two less demanding crops

IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

b. Results at the end of the season



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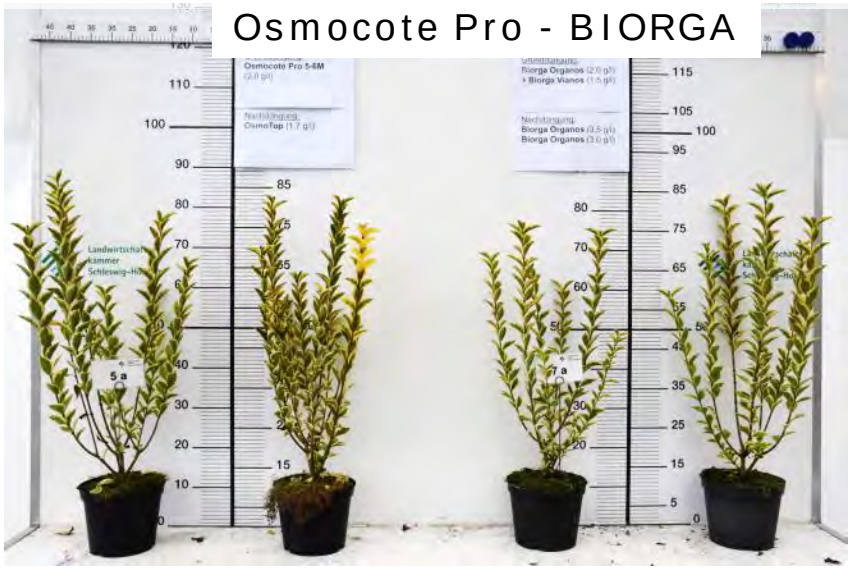
IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

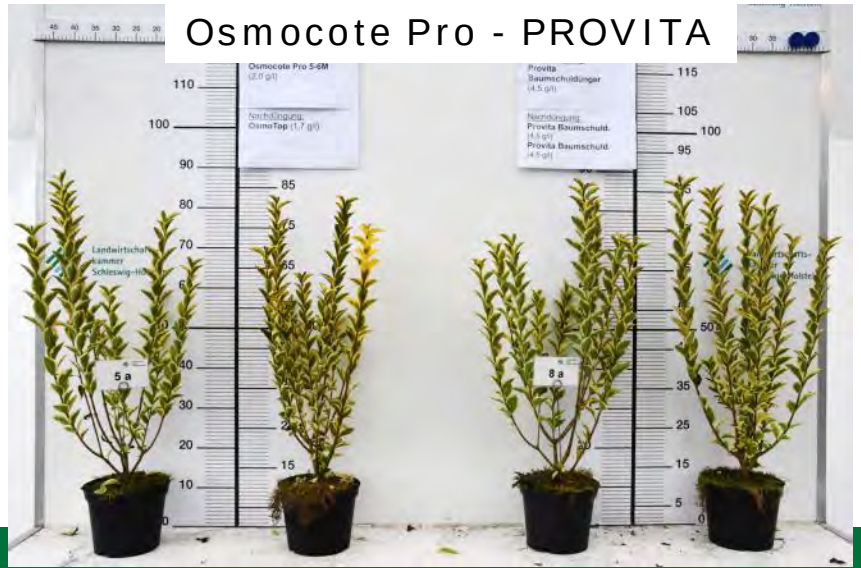
b. Results at the end of the season

Osmocote Pro - DCM

Osmocote Pro - BIORGA



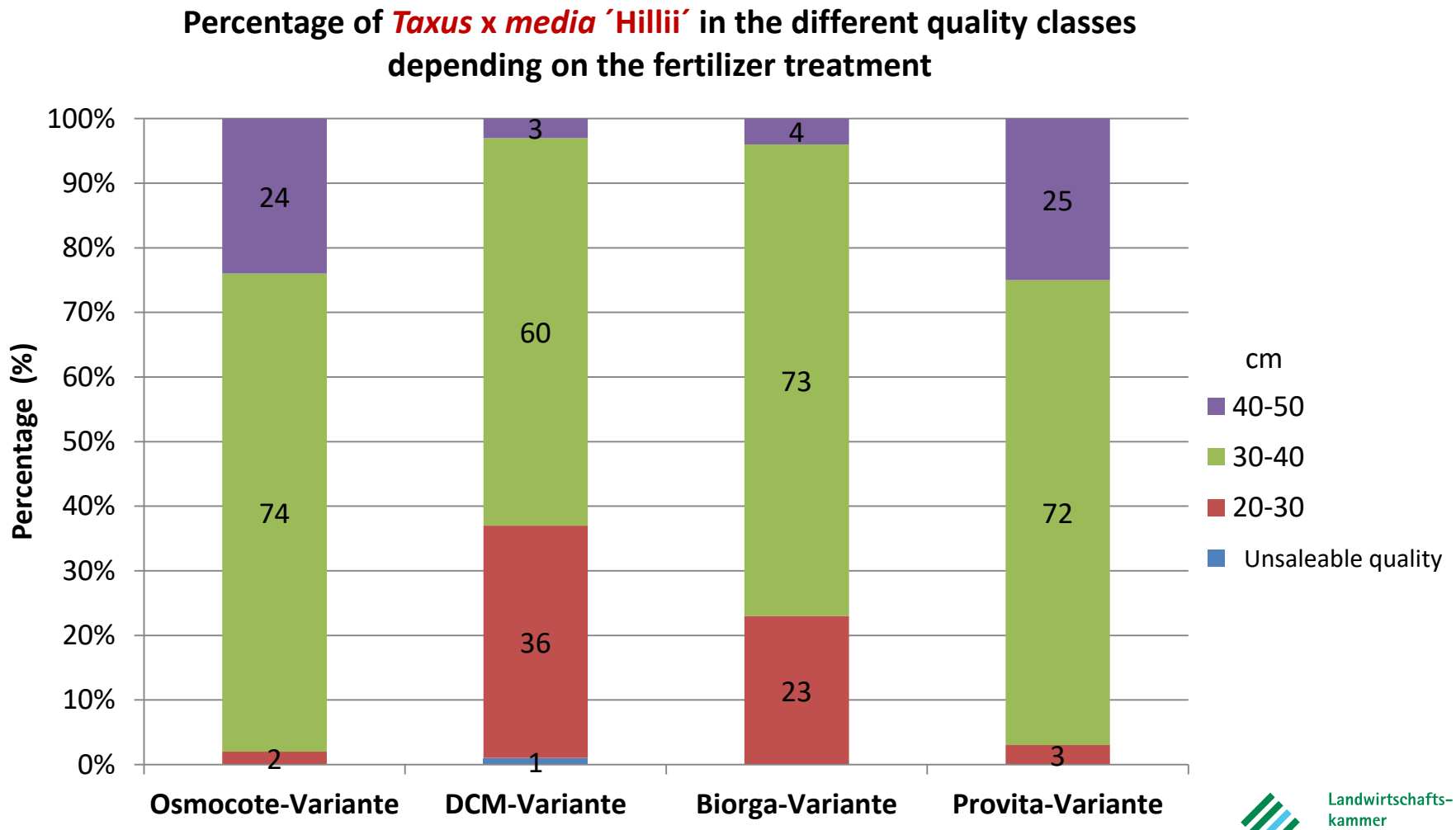
Osmocote Pro - PROVITA



IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

b. Results at the end of the season



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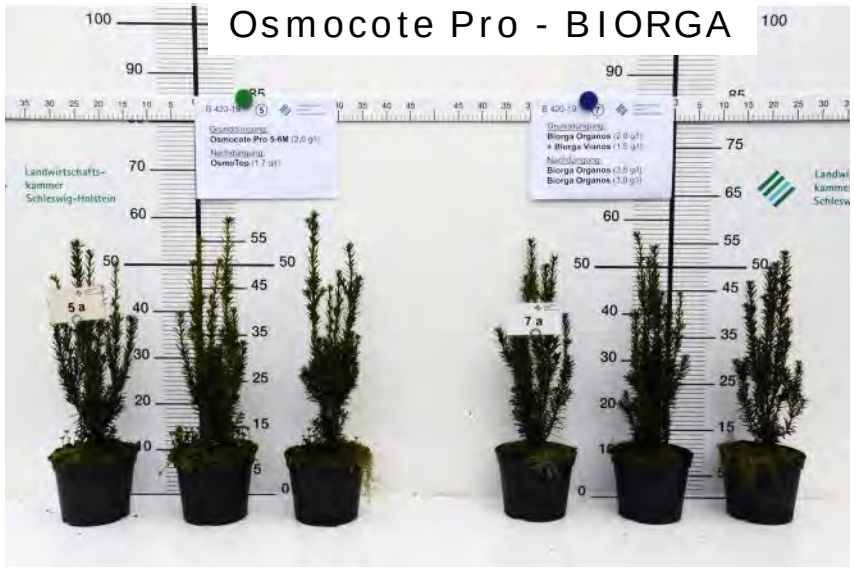
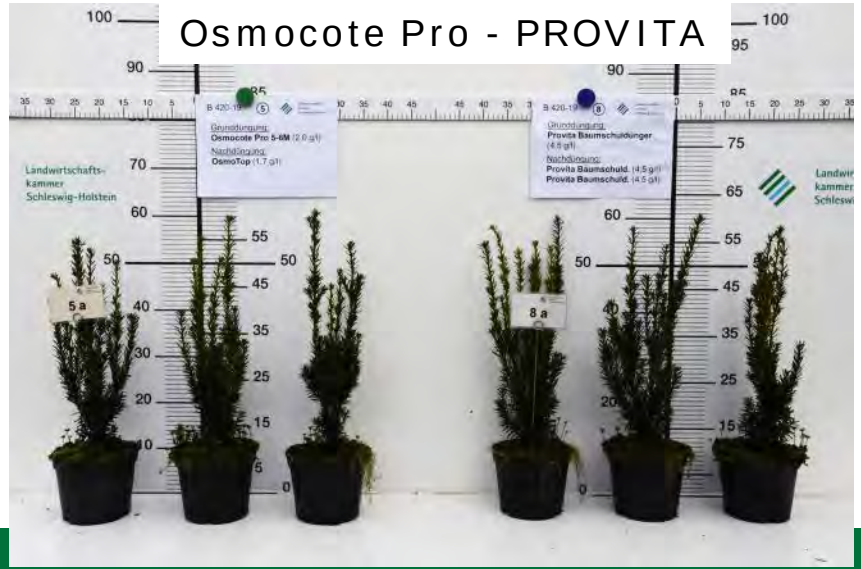


Osmocote Pro - PROVITA



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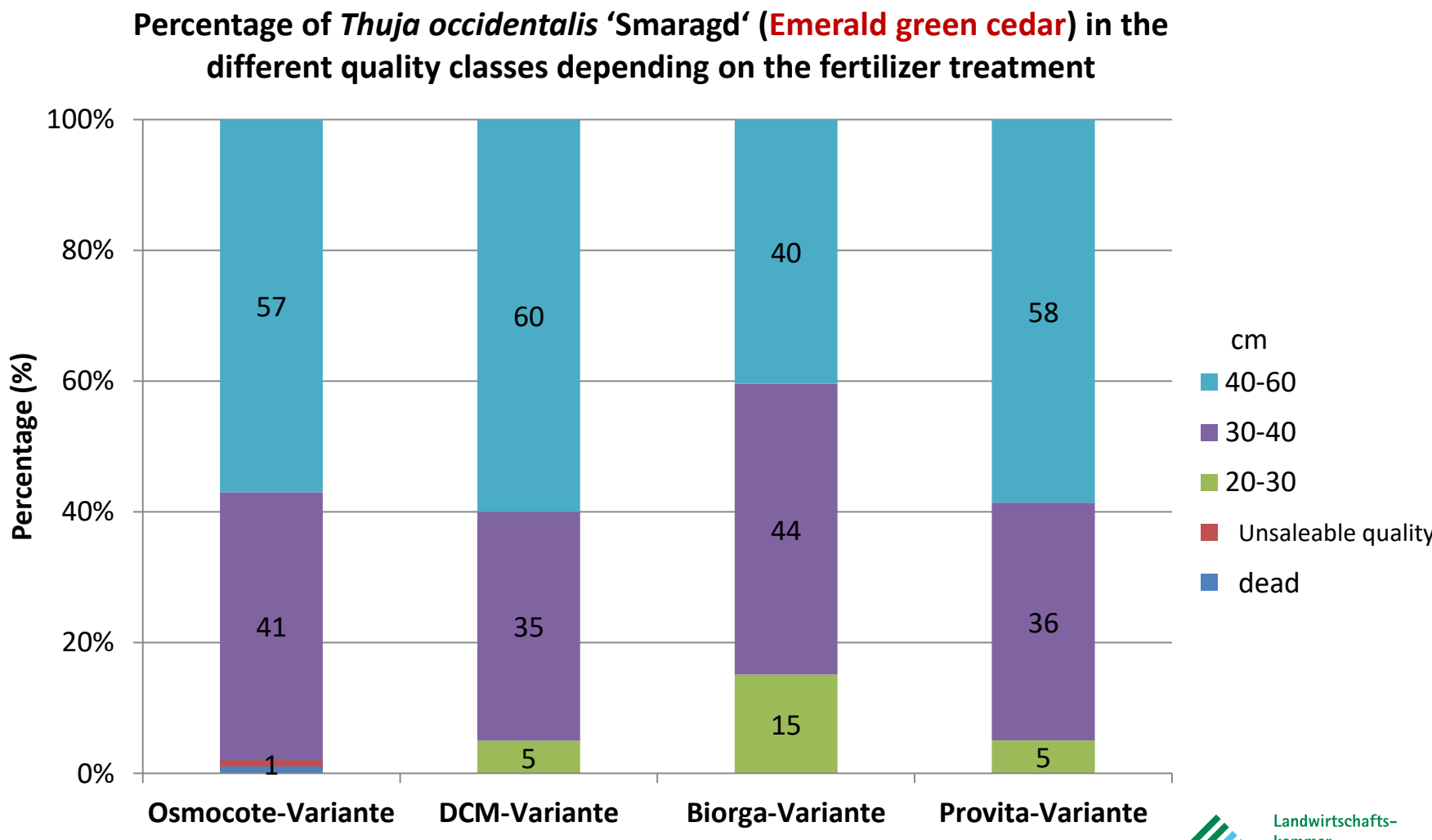

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IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

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Osmocote Pro - DCM

Osmocote Pro - BIORGA

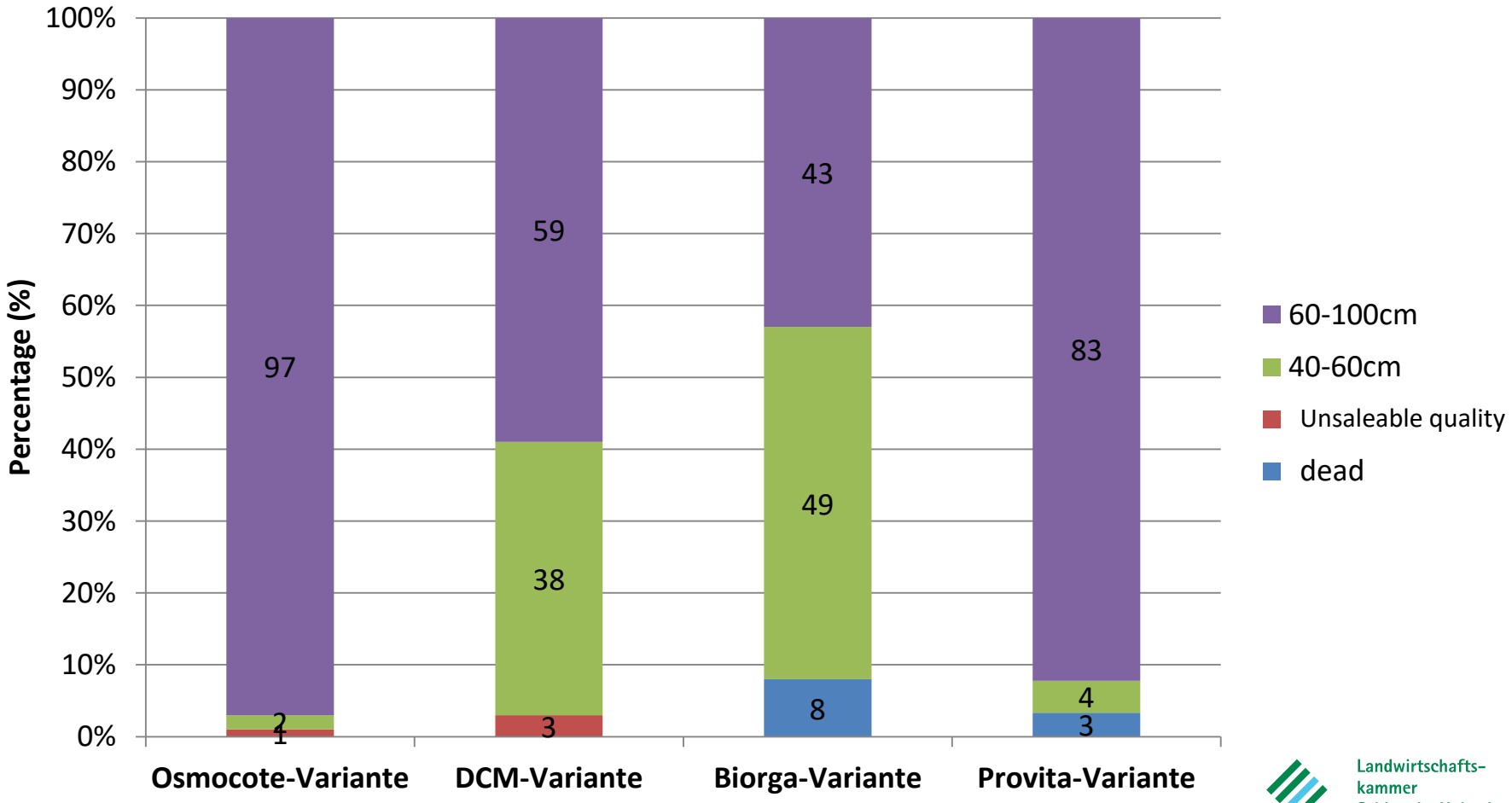
Osmocote Pro - PROVITA

IV. Organic fertilization compared to mineral fertilization

4. Results of less demanding crops (somewhat more sensitive to salt)

b. Results at the end of the season

Percentage of *Weigela* ´Bristol Ruby´ in the different quality classes depending on the fertilizer treatment



Landwirtschafts-kammer Schleswig-Holstein

IV. Organic fertilization compared to mineral fertilization

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b. Results at the end of the season

Osmocote Pro - DCM

Osmocote Pro - BIORGA

Osmocote Pro - PROVITA

IV. Organic fertilization compared to mineral fertilization

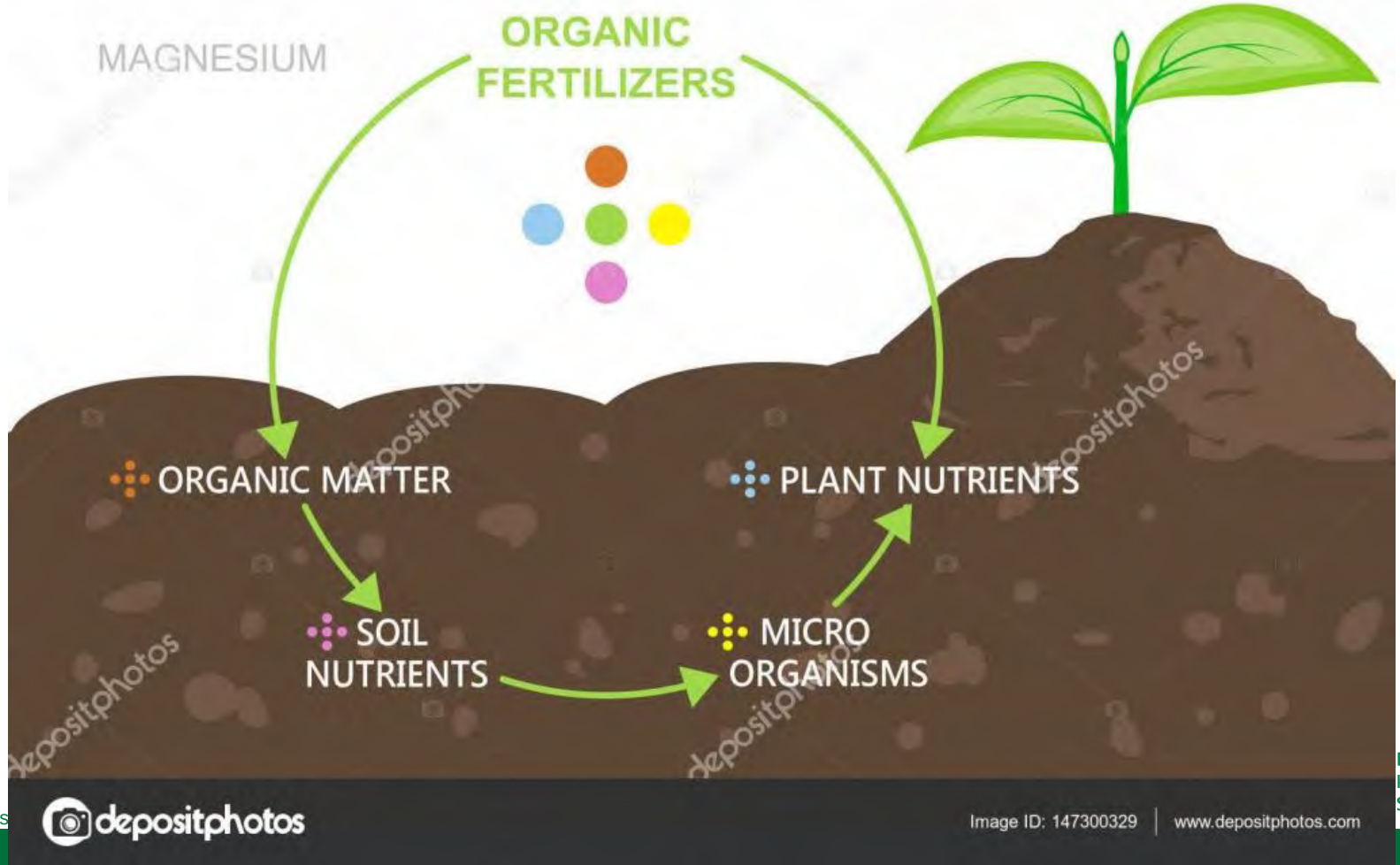
5. Summary

- ✓ Fertilizing the tested woody crops with *organic fertilizers* very often *resulted in a saleable quality*. The growers practice (from SH) with *Osmocote Pro 5-6M* mostly produced an excellent quality, except for common box
- ✓ In view of rising temperatures, it may be necessary to consider whether a change to shorter run times for coated fertilizers with late potting dates should only take place at the end of April or beginning of May (Osmocote Pro 5-6M was already empty at the end of August)
- ✓ Nursery grower would have *top-dressed in treatment Osmocote Pro* (using e.g. *Osmoform* (fertilizer with long nitrogen chains breaking down slowly), *granular fertilizers* e.g. Blaukorn or *liquid fertilizer*)
- ✓ The fertilizer *Provita-Baumschuldünger* surprised with also *excellent quality* on the level of Osm. Pro 5-6M

IV. Organic fertilization compared to mineral fertilization

5. Summary

- ✓ The fertilizer *Provita-Baumschuldünger* surprised with also *excellent quality* on the level of Osm. Pro 5-6M



IV. Organic fertilization compared to mineral fertilization

6. Outlook

- ✓ Trial was repeated in 2021 to check whether a comparable trend occurs under the conditions of 2021 (not yet completed)
- ✓ It must be emphasised that, from a purely legal point of view, a *ban* on plastic-coated fertilizers *cannot be expected in the next few years (in D!!!!, IRL ????)*
- ✓ Nevertheless *NGOs*, *trade* and *consumers* may nevertheless make a rethink necessary in nursery practice

2021

Aster

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

1. Background

Cause of symptoms:

- ✓ Sodium (Na+), mostly from the irrigation water

- ✓ Results from LVG Bad Zwischenahn and VuB Baumschulen e.V. (= Experimental and advisory ring for tree nurseries)in Ellerhoop point to Na as the cause of necrosis at the leaf edge of cherry laurels

- ✓ Na content in the irrigation water in Ellerhoop:
  - 25 ppm (first year)
  - 14 ppm (second year)

⇒ (1 ppm Na = 1 mg Na/l irrigation water)

⇒ a very well known laboratory in Germany for horticultural analysis and the analysis of horticultural irrigation water classifies Na contents below 30 ppm as suitable for very sensitive crops

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Varieties tested a few year ago

1) 'Baumgartner'	17) 'Leander'	32) 'Prufon'
2) 'Bertini'	18) 'Linus'	33) 'Prutondi'
3) 'Caucasica'	19) 'Latifolia'	34) 'Pruzab'
4) 'Cherry Brandy'	19) 'Mano'	35) 'Renault Ace' PBR
5) 'Diana'	20) 'Marbled White'	36) 'Reynvaanii'
6) 'Etna' PBR	21) 'Mari'	37) 'Rotundifolia'
7) 'Gajo'	22) 'Mecky'	38) 'Rudolf Billeter'
8) 'Genolia'	23) 'Micheana'	39) 'Schipkaensis'
9) 'Green Carpet'	24) 'Miky'	40) 'Schipkaensis' Typ Holland
10) 'Green Gloss'	25) 'Mount Vernon'	41) 'Schipkaensis Macrophylla'
11) 'Green Mantle'	26) 'Novita'	42) 'Typ Balke'
12) 'Green Survival'	27) 'Otto Luyken'	43) 'Typ Berger'
13) 'Herbergii'	28) 'O. Luyk.' Typ Beckmann	44) 'Van Nes'
14) 'Ivory'	29) 'Paradise' PBR	45) 'Van Nes' Typ Spilkers
15) 'Klari'	30) 'Parviflora'	46) 'Winterstar' PBR
16) 'Kleopatra'	31) 'Piri'	47) 'Zabeliana'

Tested under four different cultivation conditions

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kammer
Schleswig-Holstein

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

All varieties are propagated as rooted cuttings
From plants grown since many year in the
experimental station in Ellerhoop

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

- ✓ 1. With rootedt cuttings grown in Tb9 in a greenhouse with watering boom irrigation

= Tb9 = Square pot approx. 9by9by10cm, approx. 0.5 liters

- ✓ Important: No rain in the greenhouse!!!!!

=>No rain means that there is no dilution of water that is given through the irrigation system

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

Young cherry laurels in Tb9 grown in greenhouse with watering boom irrigation

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

✓ 2. With young plants also in Tb9 grown outside on the

container crop site

with watering boom

=> Dilution of irrigation water thru rain

=> Less sodium is taken up by the plants compared with plants grown in greenhouse

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

Young cherry laurels in Tb9 grown container crop site with watering boom

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

- ✓ 3. Cherry laurels grown in 3 l containers in greenhouse with wartering boom irrigation

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

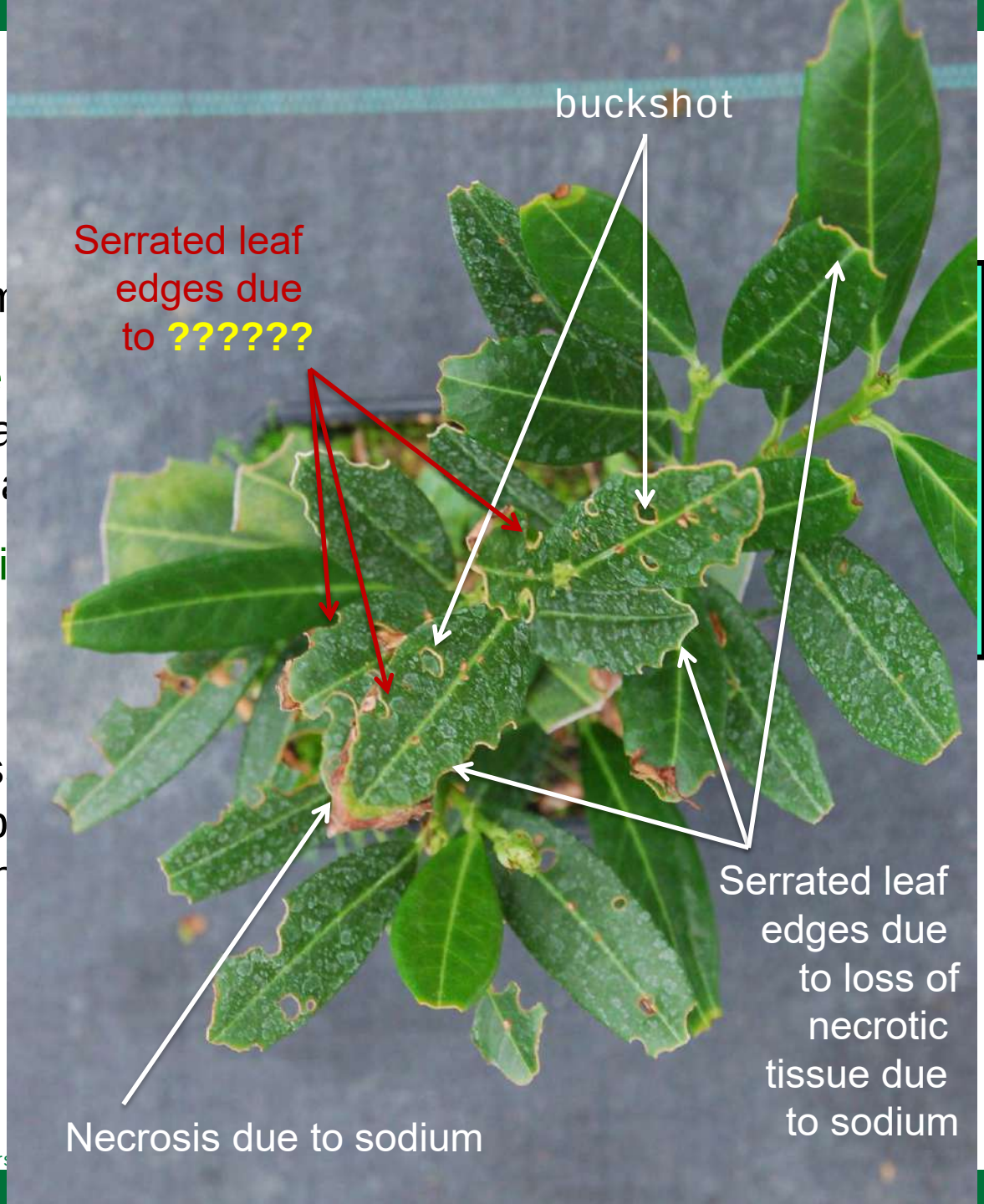
2. Experimental setup

✓ 4. Cherry laurels grown in 3 l containers outside an container crop site with wartering boom irrigation

V. Sodium sensitivity of

2. Experimental setup

- ✓ Grading of the experim
  - Sodium damage necrosis on the lea at the tip of the lea
  - Overall impressi
- ✓ Clear delimitation or as difficult (=> Bacterial b *morsprunorum*) versus r to sodium)



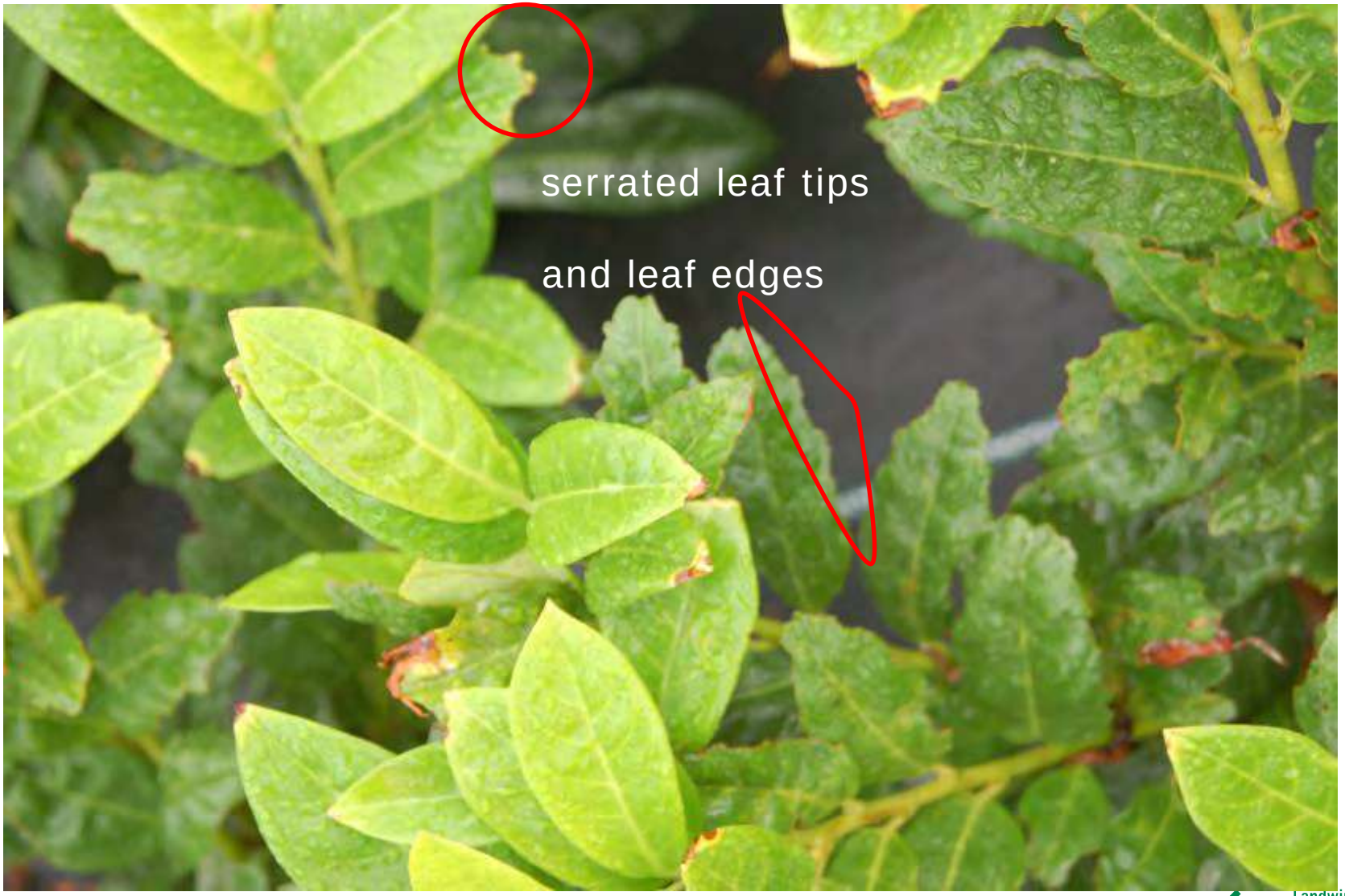
V. Sodium sensitivity of ch

2. Experimental setup

- ✓ Often the necrotic, dead tissues detached from the leaves....
- ✓ ...which then led to the more or less strongly serrated leaf tips and leaf edges

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

2. Experimental setup



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V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

- ✓ As expected, the symptoms were much more pronounced in the greenhouse than outdoor on container crop site

- ✓ => no rain, therefore also no dilution of the Na concentration in the greenhouse => more and stronger symptoms

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V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

'Caucasica'

✓ Result: Grade 3 = good, only slight sensitivity to Na

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

✓ Result: Grade 1 = very good, no sensitivity to Na

'Novita'

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V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

✓ On the other side of the scale.....

✓ Result: Grade 9 = very bad, very high sensitivity to Na

'Mari'

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V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results

very high sensitivity to Na

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V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results for varieties grown in greenhouse

1 = no sensitivity = Very good	3 = slight sensitivity = good	5 = moderate sensitivity = satisfactory
- Genolia - Novita	- Caucasica - Ivory - Parviflora - Zabeliana	- Baumgartner - Bertini - Diana - Etna PBR - Green Mantle - Green Survival - Herbergii - Klari - Linus - Mano - Miky - Mount Vernon - Paradise - Prufon - Renault Ace - Reynvaanii - Rotundifolia - Rudolf Billeter - Schipkaensis - Schipkaensis Macrophylla - Schipkaensis Typ Holland - Typ Berger - Winterstar

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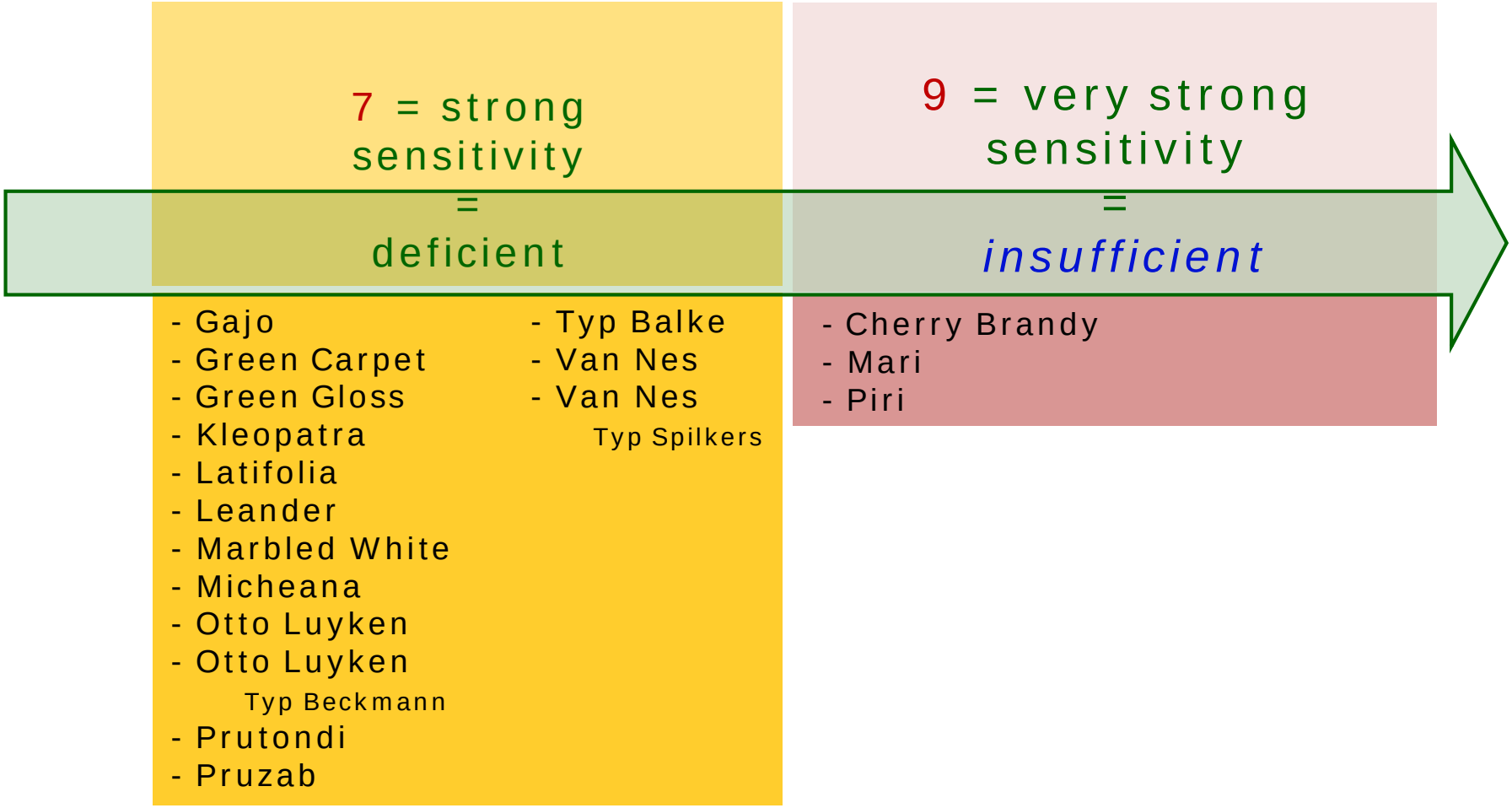
V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results for varieties grown in greenhouse



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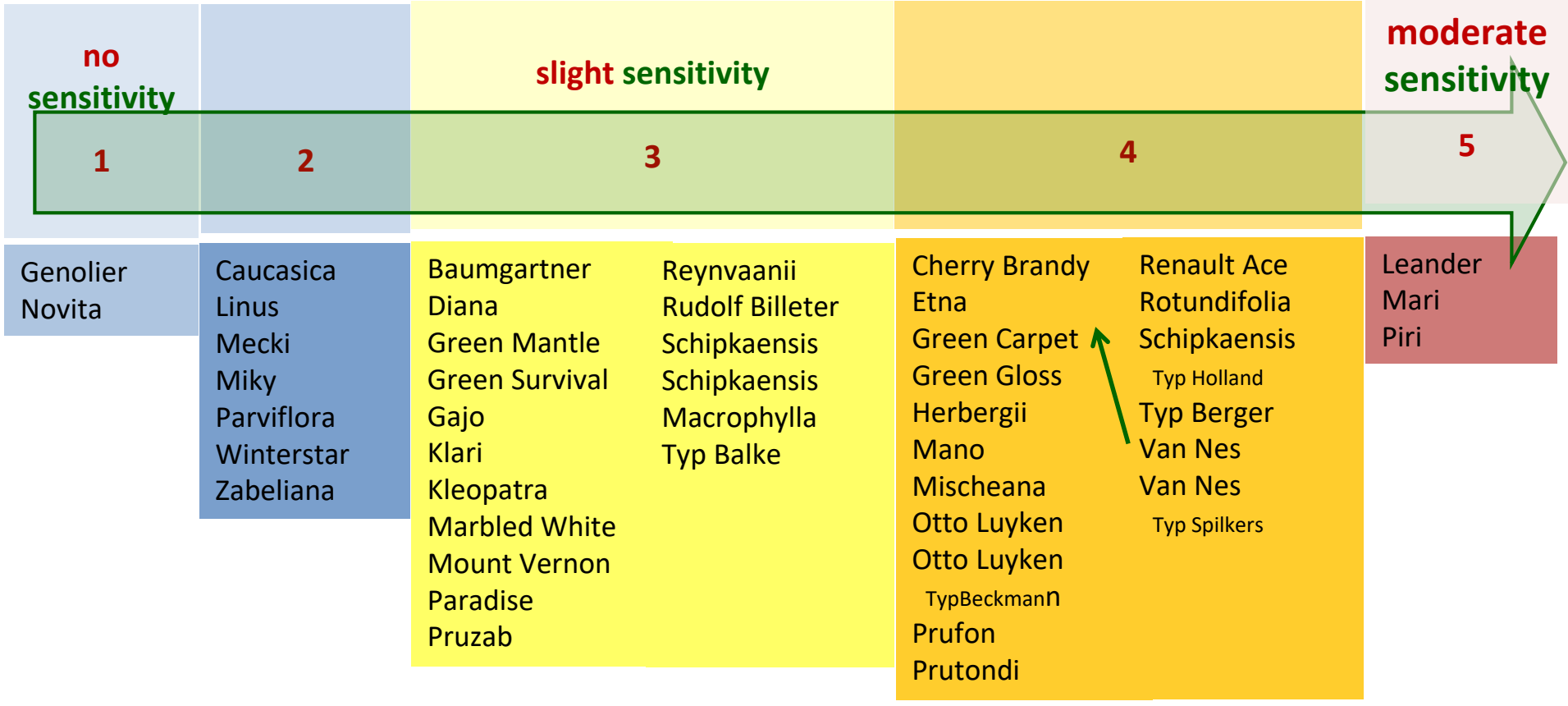
V. Sodium sensitivity of cherry laurel varieties *(during growth in containers)*

3. Results for varieties grown outside on container crop area

✓ When grown outdoor on container crop area, all varieties showed weaker damage from sodium due to dilution of water by rainfall



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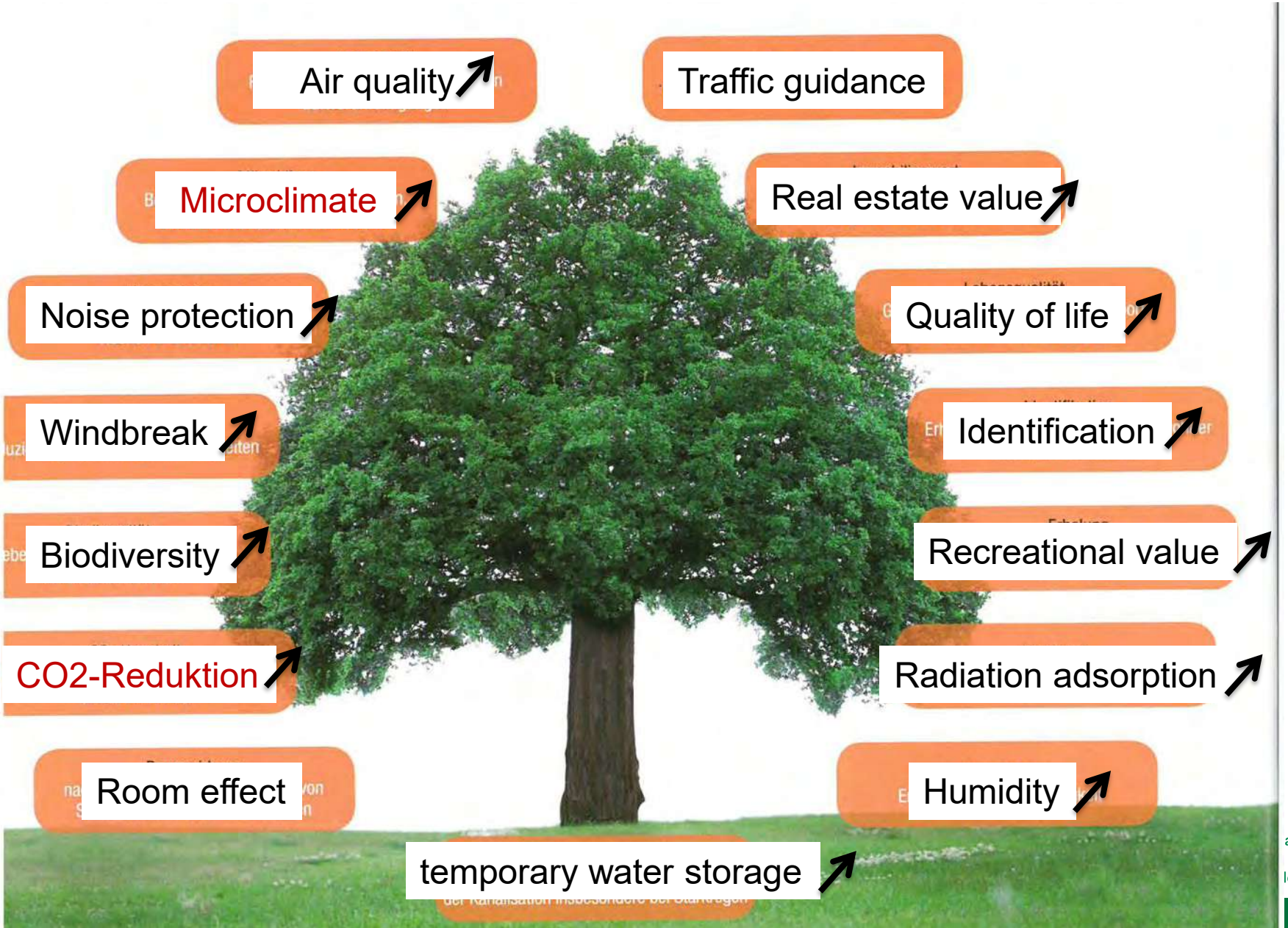
VI. Trees for urban sites in the future *(in climate change)*

VI. Trees for urban sites in the future (in climate change)

1. Services of sites covered with woody plants in the city



VI. Trees for urban sites in the future (in climate change)

1. Services of sites covered with woody plants in the city

a. CO2 budget / air purification

- ✓ Plants *consume* CO_2 and incorporate it as carbon into their substance (e.g. a *big tree (= beech, approx. 100 years old)* can process about *9500 l* CO_2 */day*)
  => approx. *60% of the* CO_2 *quantity*, which is formed daily per inhabitant in Germany

- ✓ A single *100 years old beech tree* filters e.g. the annual amount of *fine dust* out of the air, which *corresponds* to approx. that, which is *produced by a car with a mileage* of 20,000 km (=*12,400 mi*) *per year*

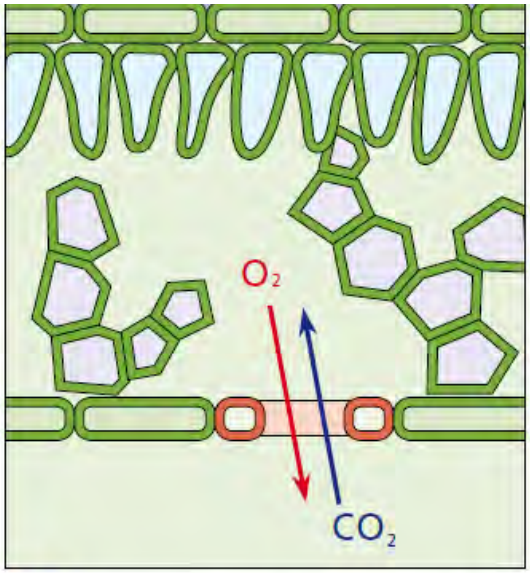


Abb. 2
Schematische Darstellung des Gasaustausches über die Spaltöffnungen an der Blattunterseite: Kohlendioxid (CO_2) wird aufgenommen und Sauerstoff (O_2) wird abgegeben. Die Cuticula auf der Blattoberseite ist in Blau dargestellt.

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VI. Trees for urban sites in the future (in climate change)

1. Services of sites covered with woody plants in the city

b. cooling / microclimate

Trees cool cities like natural air conditioning

According to researchers at Wageningen University the *cooling capacity of a big single tree* can be *20 to 30 kilowatts*. A considerable output! In comparison, an *air conditioner that cools a room* has around *2 kilowatt*

Cities are getting warmer and warmer - trees bring cooling

VI. Trees for urban sites in the future (in climate change)

1.Services of sites covered with woody plants in the city

b. cooling / microclimate

- ✓ *Cooling effect* of a green area in the city is *3-11°C*
- ✓ *Cooling effect* works within a radius of up to *300 m around the green area*

BADER (2010): https://www.spektrum.de/news/gegen-die-hitze-der-stadt/1031003

www.intercoiffure-lesartistes.ch/322-abkuehlung-gefaellig.html13)

VI. Trees for urban sites in the future (in climate change)

2. Criteria that a tree species or variety must meet in order to be suitable as an urban tree in climate change

- ✓ high *heat* and *drought tolerance* (=> But without water no plant will grow or survive!!!!!)
- ✓ High *winter frost* and *late frost tolerance*
- ✓ Low *demands on location* and *soil* (e.g. pH, soil compaction, poor space for root growth)
- ✓ Low *susceptibility to disease* and *pests*
- ✓ High *storm resistance*
- ✓ Woody plants from *Southeastern Europe*, the *Caucasus*, *North America* and *Asia* are currently expected to have the highest future viability => From regions *where the climate is today as it is forecast for us* =>But what exactly is the forecast for us???????
- ✓ By the way, the *exclusive use of native woody plants* will not be crowned with success in this context

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VI. Trees for urban sites in the future (in climate change)

- ✓ First experimental site with 48 tree varieties (5 plants per varietie) in summer 2011
- ✓ After four years every second tree (over all 114 trees) from this site was transplanted to Hamburg-City to test them under real urban conditions

VI. Trees for urban sites in the future (in climate change)

3. Urban Green North 2025 - an EIP project

Wir fördern den ländlichen Raum

EU.SH

Landesprogramm ländlicher Raum: Gefördert durch die Europäische Union – Europäischer Landwirtschaftsfonds für die Entwicklung des ländlichen Raums (ELER) und das Land Schleswig-Holstein
Hier investiert Europa in die ländlichen Gebiete

✓ Together with the cities:

	Heide	Husum	Kiel	Lübeck
✓ Number of tree species and varieties	10	10	20	20

✓ From January 2016 until the end of 2019 (funding expired)

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VI. Trees for urban sites in the future *(in climate change)*

3. Urban Green North 2025 - an EIP project

✓ Range of trees tested in the project

1. ***Acer buergerianum***
2. ***Acer monspessulanum***
3. ***Alnus* x *spaethii***
4. ***Carpinus betulus*** **`Lucas´**
5. ***Celtis australis***
6. ***Fraxinus ornus*** **'Obelisk'**
7. ***Fraxinus pennsylvanica*** **`Summit´**
8. ***Ginkgo biloba*** **'Fastigiata'**
9. ***Gleditsia triacanthos*** **`Skyline´**
10. ***Liquidambar styraciflua***
11. ***Magnolia kobus***
12. ***Ostrya carpinifolia***
13. ***Parrotia persica***
14. ***Quercus cerris***
15. ***Quercus frainetto*** **`Trump'**
16. ***Platanus orientalis***
17. ***Sophora japonica*** **`Regent´**
18. ***Tilia tomentosa*** **`Brabant´**
19. ***Ulmus*** **`Rebona´**
20. ***Zelkova serrata*** **`Green Vase´**

✓ *5 copies* of each species/variety *per city*

✓ Unfortunately, only the initial phase of trees at their urban sites was funded during the project period.

✓ Necessary is an observation period of 10-15 years
=> unfortunately, no funding can be obtained for this period

VI. Trees for urban sites in the future *(in climate change)*
3. Urban Green North 2025 - an EIP project

Sweet gum, *Liquidambar styraciflua*
(Northamerika)

Overall grading: good

Comments:

- Growth still a bit weak in parts

- Beautiful fall coloration

- Trunk with ornamental cork strips

VI. Trees for urban sites in the future *(in climate change)*

3. Urban Green North 2025 - an EIP project

Manna-ash **'Obelisk',** *Fraxinus ornus* **'Obelisk'**
(Southeast Europe, West Asia)

Overall grading: very good

Comments:

- One failure due to drought stress
  (reason: error in planting and care)

- crown shape very attractive and uniform

- conspicuous flowering

VI. Trees for urban sites in the future (in climate change)

3. Urban Green North 2025 - an EIP project

Trident maple, *Acer buergerianum*
(Japan, East China)

Overall grading: unacceptible

Comments:

- One failure (scratching of the trunk by cat => subsequently red pustule infestation)
- Crown initially with frost and drought damage=> subsequently one-sided crown shape with strong wind exposure
- very strong fruiting after the dry year 2018

VI. Trees for urban sites in the future *(in climate change)*
3. Urban Green North 2025 - an EIP project

Persian ironwood, *Parrotia persica*
(Southwest Asia)

Overall garding: good

Comments:

- Foliage regularly showed brown leaf spots/edges on many specimens in early summer, probably due to elevated salinity and pH levels in the substrate

- magnificent fall coloration

Maidenhair tree **'Fastigiata',** *Ginkgo biloba* **'Fastigiata'** (China)

Overall grading: satisfactory

Comments:

- Very slow growth
- with strong planting cut the leading shoot partly tilted to the side (crowns stabbed)
- in the dry year 2018 partly strong browning of the foliage occurred

VI. Trees for urban sites in the future (in climate change)
3. Urban Green North 2025 - an EIP project

Montpelier maple, *Acer monspessulanum*
(Central -, Southern Europe, NW Africa)

Overall grading: good

Comments:

- Partial aphid infestation in spring and cicada aphid damage => both did not affect tree development

VI. Trees for urban sites in the future (in climate change)
3. Urban Green North 2025 - an EIP project

Hop hornbeam, *Ostrya carpinifolia*
(Southeast Europe, West Asia)

Overall grading: satisfactory

Comments:

- Establishment difficulties in 2016/2017 in all three cities, three trees did not grow, drought stress e.g. due to neighboring old tree.

- Increased care in watering during the establishment phase urgently needed

Honey locust **'Skyline'**, *Gleditsia triacanthos* **'Skyline'**

(Nordamerika)

Syn: 'Skycole'

Overall grading: good

Comments:

- 2 failures (lack of water in planting year and vandalism)

- Site Kiel with clear frost damage

VI. Trees for urban sites in the future *(in climate change)*

3. Urban Green North 2025 - an EIP project

Northern Japanese magnolia, *Magnolia kobus* (Japan)

Overall grading: good

Comments:

- Slow growth
- foliage often light green
- attractive flower
- one failure due to vandalism

VI. Trees for urban sites in the future *(in climate change)*

3. Urban Green North 2025 - an EIP project

Oriental plane, *Platanus orientalis*
(Southeast Europe, West Asia)

Overall grading: good

Comments:

- Sycamore leaf miner (Phyllonorycter platani) and powdery mildew (Microsphaera platani) occurred mostly at low levels

- one failure

Japanese pagoda tree **'Regent',** *Sophora japonica* **'Regent'**

(China, Korea)

Overall grading: unacceptible

Comments:

- Leading shoot/middle "tilted" clearly to the side in about 50% of the trees
- at one location a part of the crown of two trees broke out in spite of rods (wind gust by truck)
- one failure (drought stress -> oak leaf beetle)

Spaet's Alder, *Alnus* x *spaethii*
(Hybrid)

Overall grading: very good

Comments:

- Good growth

- Leaf feeding by alder leaf beetle larvae (Agelastica alni) so far unproblematic

Resista-**Ulme 'Rebona',** *Ulmus* **'Rebona'**
(Breeding, USA)

Overall grading: very good

Comments:
- Tree species with the strongest growth during the project period

American ash **'Summit', *Fraxinus pennsylvanica* 'Summit'**
(North America)

Overall grading: satisfactory

Comments:

- In two trees the upper third of the crown was dead, cause still unclear

VI. Trees for urban sites in the future *(in climate change)*
3. Urban Green North 2025 - an EIP project

White beech **'Lucas',** *Carpinus betulus* **'Lucas'**
(Central Europe)

Overall impression: satisfactory

Comments:

- Clear drought stress symptoms at a wind-exposed, dry site in summer 2018 (small foliage partly with necrotic leaf spots, clearly premature leaf fall, sparse crown)

Silver lime **'Brabant'**, *Tilia tomentosa* **'Brabant'**

(Southeast Europe, West Asia)

Overall grading: good

Comments:

- Leaf damage due to caterpillar feeding and felt gall mites (*Eriophyes leiosoma*)

- two failures due to long lasting waterlogging (site under water)

VI. Trees for urban sites in the future (in climate change)
3. Urban Green North 2025 - an EIP project

European hackberry, *Celtis australis*
(Southern Europe, North Africa, Western Asia)

Overall grading: satisfactory

Comments:

- Repeated frost damage, mostly moderate freezing back of thin shoots up to about 25 cm, but one tree with severe crown damage (leading shoot and branches frostbitten)

- partly chlorotic foliage

VI. Trees for urban sites in the future (in climate change)
3. Urban Green North 2025 - an EIP project

Hungarian oak, *Quercus frainetto*
(Southeastern Europe, Turkey)

Overall grading: satisfactory

Comments:

- Requires secure attachment for a long time, especially with strong wind exposure
- slow growth as well as thickness growth
- two failures, reason: drought stress => oak shatter beetle infestation => increased care in watering is therefore urgently needed

Japanese zelkova **'Green Vase'**, *Zelkova serrata* **'Green Vase'** (Japan)

Overall grading: good

Comments:

- Beautiful fall foliage coloration
- sporadic frost damage
- one failure (cause unknown)

VI. Trees for urban sites in the future (in climate change)
3. Urban Green North 2025 - an EIP project

Turkey oak, *Quercus cerris*
(Southeast Europe, West Asia)

Overall impression: very good

Comments:
- Completely free of trouble at all sites in the project

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