



Optimising water retention capacity of growing media used in vertical gardening

Summary of the original trial report in Dutch:

“Optimalisatie van waterretentie bij substraten voor toepassing bij groene gevels”

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Author: PCS (*)

(*) Belgian Experimental Station for Ornamental Plants (Proefcentrum voor Sierteelt)

Trial done in the framework of IWT140993:



GREEN BUILDING
Green walls for sustainable buildings and cities

1. Trial objective

Early 2015 a consortium of research stations and private companies was formed to bring knowledge together on greening façades of buildings. Although a research topic in full expansion in Europe, studies in Belgium are scarce. As a result, too often wrong choices are made when constructing green walls.

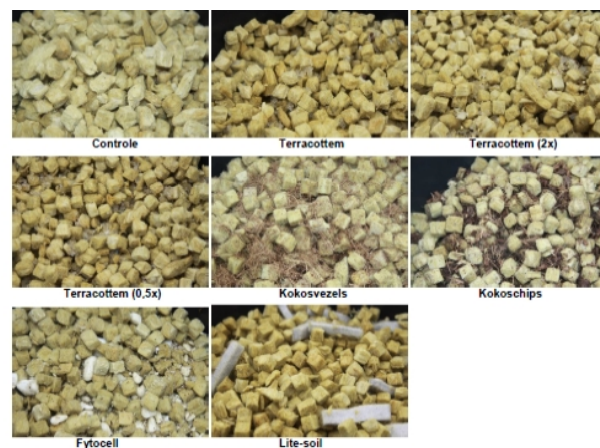
Groen Bouwen wants to increase the overall knowledge on the subject and optimise existing systems. One of the fields of investigation is the choice and composition of the growing media.

TerraCottem BVBA, as member of the project group, had TerraCottem® universal analysed as one of the soil amendments.

2. Set-up

The trial was set up at the Belgian Experimental Station for Ornamental Plants. Vertical tubes (H: 100cm; Ø: 15cm) were filled with rockwool (a commonly used growing medium in vertical walls). The rockwool (control) is mixed with different soil amendments:

- TerraCottem® universal (TCU):
 → 2.5g/l (half) – 5.0g/l (normal) – 10.0g/l (double);
- Coco fibres;
- Coco chips;
- Fytocell;
- Lite-soil;



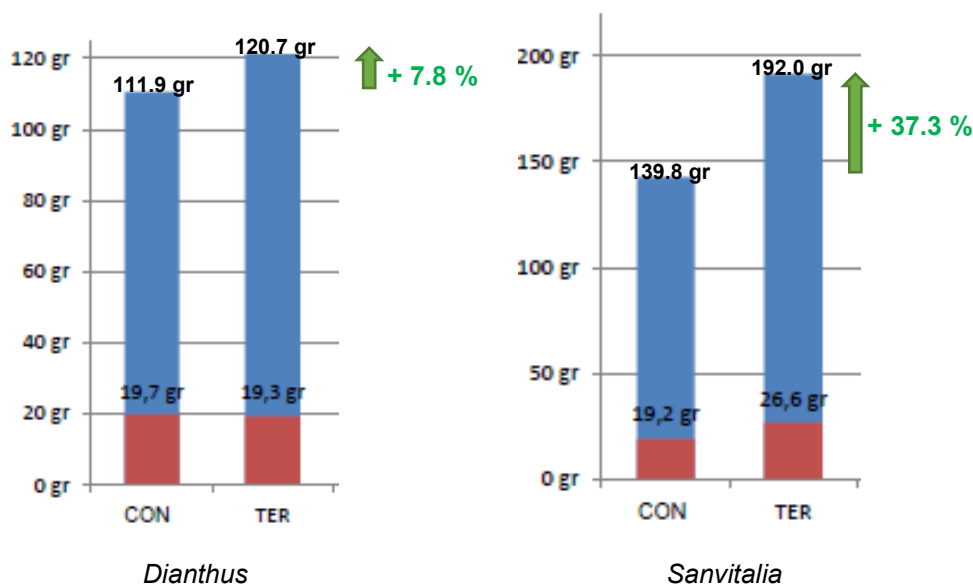
The tubes with 4 openings along the side, were alternately planted with *Dianthus* and *Sanvitalia*:

- Fresh weight (FW) and dry weight (DW) biomass production were measured at the end of the trial by cutting the plants and weighing them before and after drying.
- Total water retention capacity (WRC) of the (amended) growing media was determined by calculating the difference in volume of water IN (irrigation) minus volume of water OUT (drainage) when saturated.
- Also, the evolution of the WRC over time was analysed by inserting moisture probes at different times.



3. Results

3.1 Biomass production



- A positive effect of the presence of TerraCottem® universal was observed on FW biomass production:
 - TCU scored best (*Dianthus*, left) and
 - 4th best (*Sanvitalia*, right, very close to top-3 and big difference to the other ones).
- The DW of the *Sanvitalia* plants was also much higher when TCU was added.
- There was an inconclusive effect of half and double dosage.

3.2 Total water retention capacity

vochtigheids van het substraat

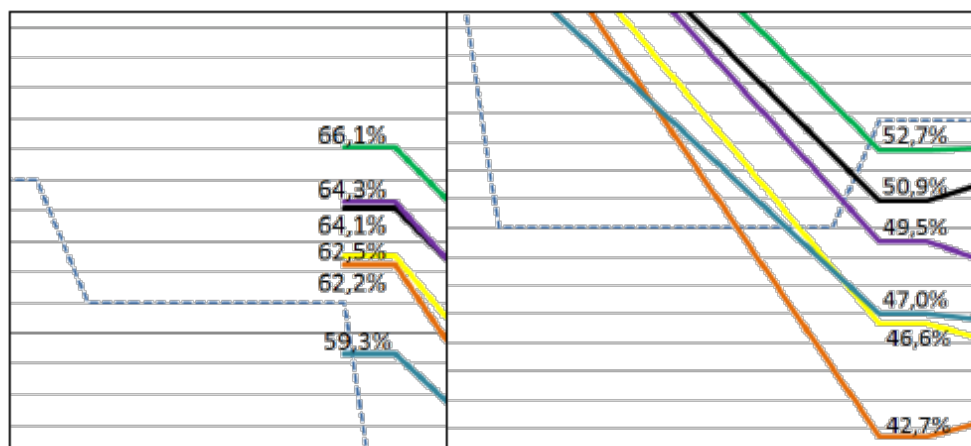
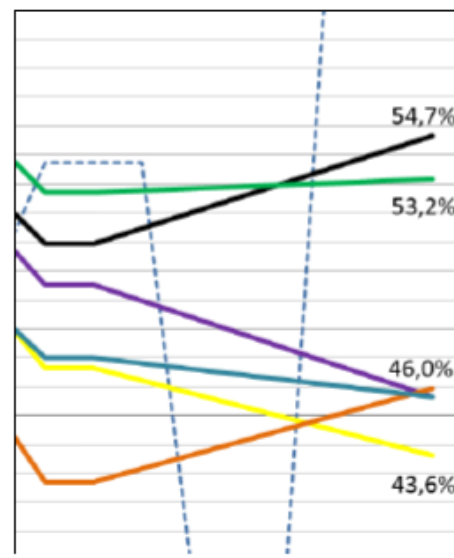
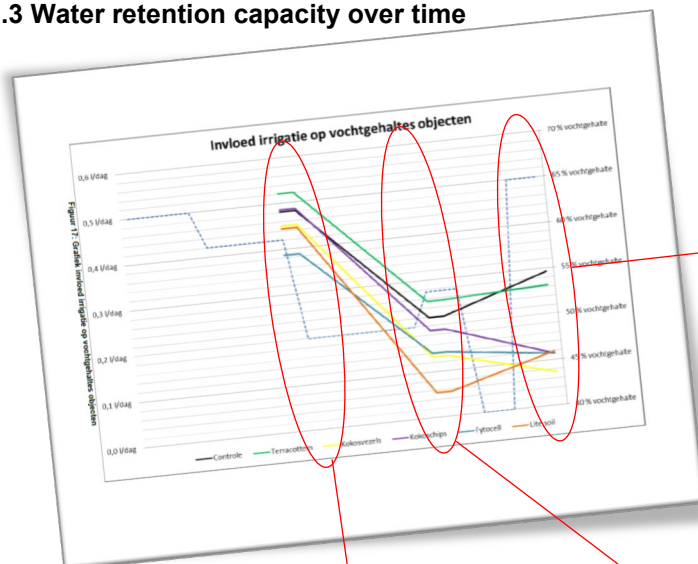
Maximale wateropname
Bij aanvang van de proef werd het verzadigingspunt (=maximale wateropname) geregistreerd. Dit aspect geeft indirect invloed op de waterretentie, door de hoge negatieve invloed van een beperkte waterretentie uitgesteld worden.

Tabel 2: Gemiddelde geregistreerde waarden bij verzadiging proefobjecten

Nr.	Object	Irrigatie tot verzadiging	drainvolume	Inhoud	Obj/ref
1	CON	11416,7 ml	9925,1 ml	1491,6 ml	REF ↓
2	TER	13083,3 ml	7294,7 ml	5788,7 ml	x 4
3	TER x2	15000,0 ml	7527,4 ml	7472,6 ml	x 5
4	TER x0,5	12916,7 ml	8800,2 ml	4116,5 ml	x 3
5	KOV	12166,7 ml	9496,2 ml	2670,5 ml	x 2
6	KOC	11000,0 ml	9222,6 ml	1777,4 ml	x 1
7	FYT	12416,7 ml	10826,2 ml	1590,5 ml	x 1
8	ITE	11500,0 ml	9679,5 ml	1820,5 ml	x 1

- The WRC of rockwool was multiplied by 4 when adding 5g/l of TerraCottem® universal.
- When adding half the recommended dosage: WRC x 3; when adding a double dosage: WRC x 5.

3.3 Water retention capacity over time



3 measurements are shown in the graphs on the previous page:

1. At the start of the trial;
2. After the first period of drought (no irrigation);
3. At the end of the trial: the substrates are re-saturated;

- The **black** line = control
- The **green** line = TCU
- The **dotted** line = irrigation. This line decreases over time meaning that the volume of irrigation is gradually lowered (drought). At the end, the substrates are re-saturated, represented by the steep increase of the dotted line.

- First observation:

- Only TCU (**green**) and 1 other amendment (**purple**) show a bigger WRC as compared to the control;
- Remark: this WRC measurement via probes is much lower than total WRC (page 2). This alone illustrates the difficulty of using probes for measuring moisture content in growing media amended with hydrogels and soil conditioners containing hydrogels. That's because the water is concentrated inside these hydrogels: the insertion point of the probe is very important in that case.

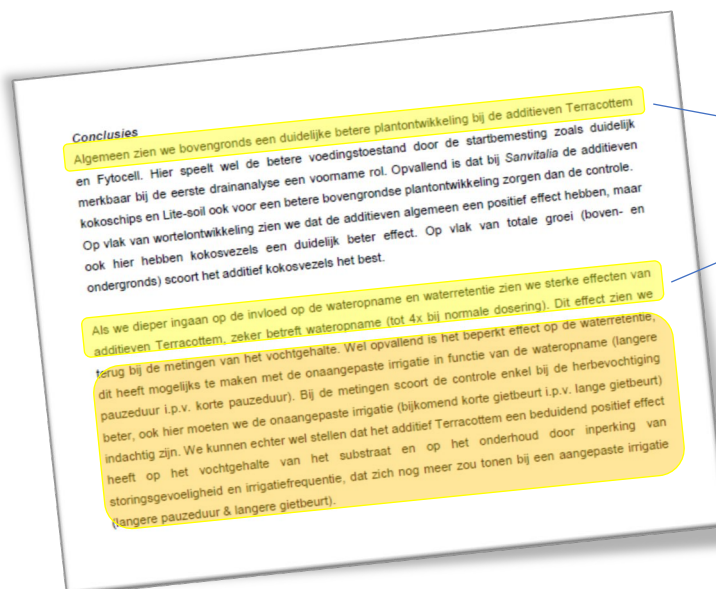
- Second observation:

- The WRC drops in all treatments, because irrigation volume is lowered and drought is initiated.
- Only TCU scores better than control: a growing medium amended with TerraCottem® universal is better protected against drought and has a better water use efficiency.

- Third observation:

- It is extremely difficult to re-saturate amended substrates;
- It seems that only the WRC of the rockwool containing TerraCottem® universal was restored to its initial state.
- Furthermore, also here the difficulty of measuring WRC via probes when dealing with polymers is present: only the moisture outside the polymers is measured, not the water within.

4. Conclusions



Better growth when TerraCottem® universal was added

Higher water retention capacity achieved

Recommendation from the author:

When adding TerraCottem® universal to growing media used in vertical greening, it might be interesting to adapt the irrigation regime (volume & duration) according to the polymers' action. A longer duration of the irrigation at a lower frequency would probably further improve the beneficial effects observed in this trial.

Full report available upon request: info@terracottem.com