

HARVESTIS

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Reuse substrate after steaming in strawberry

Harvestis nr. 44_26

with help and support of:



1 Abstract

After a successful trial in 2025 we proceeded the research on steaming substrate for the purpose of reusing it in strawberry. Last year mixing in reused steamed substrate at 95°C was successful at 20%, 40%, 60% and even 100%. Therefore we continued to reuse the steamed substrate at 100%. This year we tested the steam treatment more in line with the wishes of the Belgian growers, meaning that if they would reuse substrate, they would have substrate with all the foliage of the previous cultivation in it. So most objects were planted on shredded substrate with foliage. To compare we provided an object without foliage steamed at 95°C and one without foliage without steaming. In addition we looked at the energy consumption of the steam. Substrate coming from an autumn glasshouse cultivation with the foliage in it was shredded, set aside and steamed in March 2026 at 95°C, 85°C and 75°C. Results show again very high promise. At the lowest energy consumption at 75°C we see the same result as steaming at 95°C, even with the foliage in it, there is no problem in reusing the substrate after steaming. Previous research at Harvestis showed that reuse of substrate with foliage is the most risky and always shows a direct yield loss, reusing substrate without the foliage is less disruptive for the cultivation performance.

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3 Introduction and challenge

In 2025 substrate of an autumn cultivation was reused in a spring cultivation of the junebearer Sensation in a plastic greenhouse. A previous trial was looking at the reuse of substrate and there was substrate that was tested in 4 consecutive cultivations. Both the four times and the one time used substrate was shredded and a part of both quantities was steamed with the help of Soilsteam. A total of 17 objects were planted for a spring cultivation with the junebearer Sensation to see if reuse can be successful by steaming it at 95°C and to what extent the substrate can be reused. For this, both steamed and not steamed substrate was reused at 20%, 40%, 60% and 100%. The outcome of the trial was everything we could hope for. Reuse without steaming is costing plant performance. Crop stretching is inhibited and yield loss is suffered. But steaming restores the potential of the substrate and both stretching and yielding is comparable to growing Sensation in a fresh substrate. Used substrate without the foliage can be reused even at 100% after steaming at 95°C.

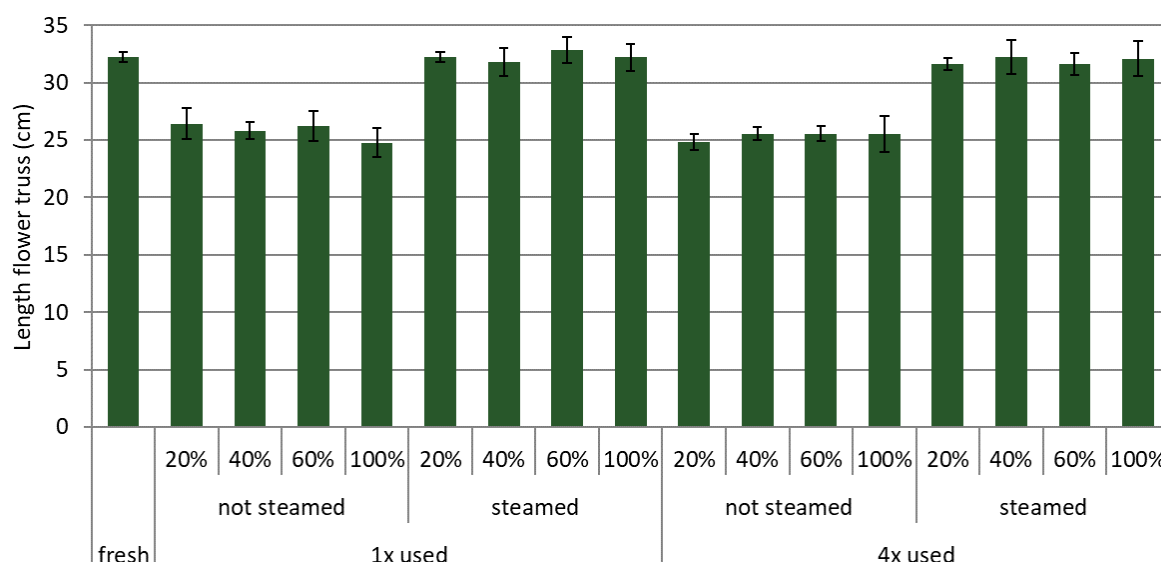


Figure 3-1 Last year we saw a total recovery of crop stretching after steaming at 95°C, even with 4x used substrate in previous cultivation.

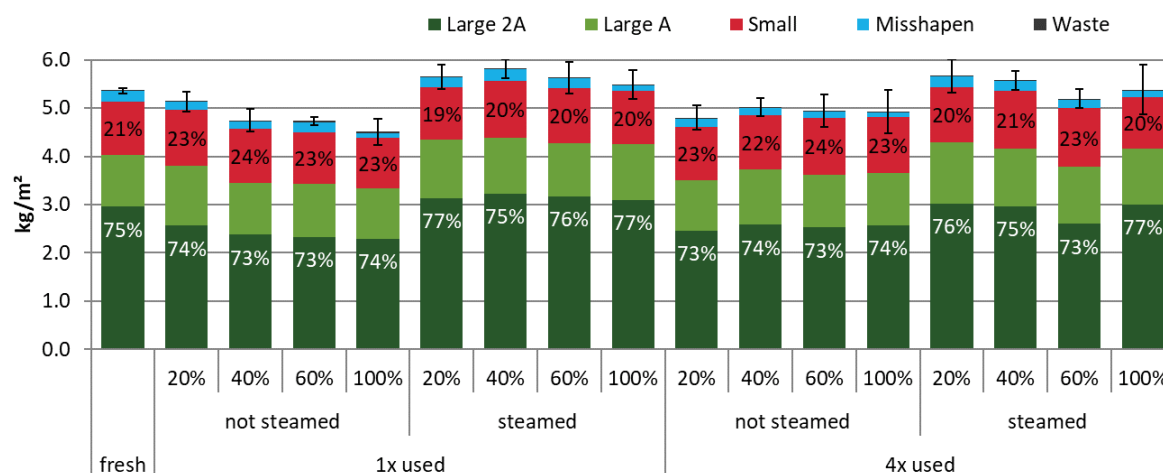


Figure 3-2 Also yield is completely restored with steaming at 95°C. Reusing substrate at 100% gives the same result as fresh substrate.

For trialling in 2026 one time used substrate of an autumn glasshouse cultivation was set aside. This time we wanted to optimize the practice of steaming by providing substrate with foliage. This is more in line with how growers would reuse their substrate. Labour is too expensive to cut away the foliage, it would be preferable to take the substrate out of the greenhouse together with the foliage, shred it and store it for reuse later on. For the reason of comparison we also provided substrate for the trial without the foliage.

Together with Soilsteam we also tried to reduce the energy consumption of the steam treatment. Instead of steaming at 95°C, we lowered the temperature to 85°C and even 75°C. It is expected that steaming at 70-75°C will only use half of the energy needed to steam at 95°C. This would mean a huge surplus for the cost of the steam treatment and therefore the practical application of the treatment by strawberry growers in Belgium.

4 Trial set-up

4.1 Background of the substrate

A glasshouse cultivation with the Junebearer Elsanta ended half of December 2025 at the research centre Harvestis in Hoogstraten, Belgium. The used substrate was a blend of BVB-Kekkilä and contained 75% white peat and 25% wood fibre. The majority of the substrate was set aside together with the harvested foliage, only in a few cubic meters the foliage was cut away before collecting the substrate on a heap. On 3 February 2026, both heaps were shredded with the aid of Heecon bvba. This company is commonly hired for shredding purposes by the strawberry growers in the region of Hoogstraten. 1 m³ of substrate with foliage and 1 m³ of substrate without foliage was taken aside, and will serve as untreated controls for the objects with steamed substrate.

4.2 Steaming of substrate

On 3 March 2026 a total of 4 batches of substrate were steamed. The first 2,5 m³ of trial substrate went in at 10h24 for a steam treatment at 95°C. This substrate contained foliage. Right after the same amount of substrate without foliage went in for the same temperature treatment. The profile of power consumption shows a power usage of 160 kWh to generate the steam at 95°C. At 11h20 we started to cool down. At 12h03 the batch of 0,5 m³ with foliage went in for a steam treatment at 85°C. At that time the machine was using 120 kWh. Afterwards we cooled down again and at 12h29 the final 0,5 m³ batch with foliage went in for the treatment at 75°C. For this final treatment the power consumption was 90 kWh. As visible in the temperature profile, it is difficult to maintain a fixed temperature in the steam cabin, but the differences between the 3 tested temperatures are clearly visible.

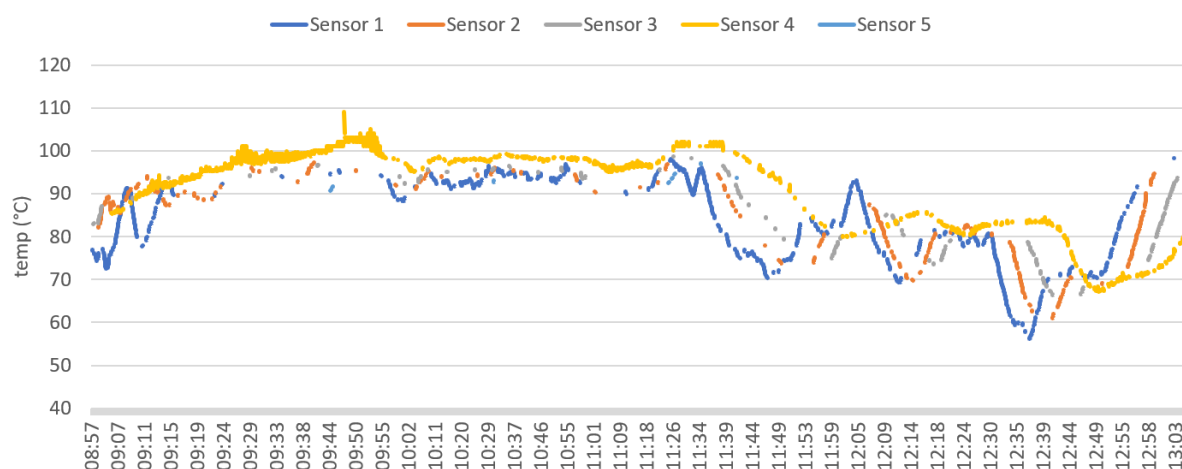


Figure 4-1 Temperature profile of the different steam treatments in succession

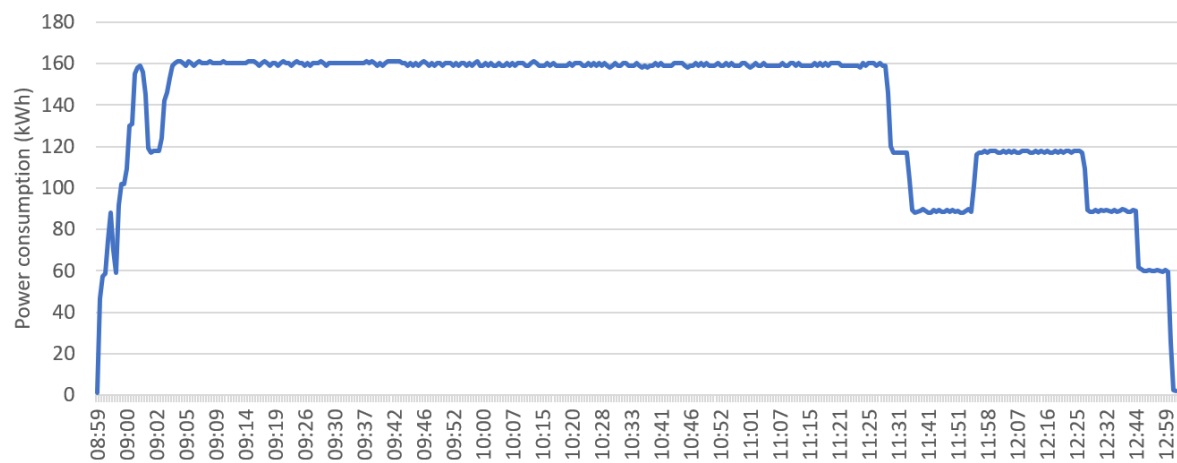


Figure 4-2 Power consumption of the different steam treatments in succession



4.3 Set-up of cultivation trial

On 11 March 2026 Sonsation trayplants were planted in 8 different objects. The trial was planted as a spring cultivation in a non-heated plastic greenhouse of the type Van Den Heuvel, exactly the same cultivation system that was used for the trial in 2025. The first object is the control with fresh substrate of a 75% peat and 25% woodfibre mixture. The two following objects are grown on reused substrate without foliage: the untreated control of shredded substrate and the treated version at 95°C. The following 4 objects reuse substrate with the foliage in it: the untreated control, the steam treatment at 95°, 85°C and finally 75°C. The eighth object is an additional object that Soilsteam and Cultilene Saint-Gobain tested at Harvestis to reuse 100% shredded and steamed rock wool at 95°C.

	Object	Description
1	Fresh	75% peat - 25% wood fibre mixture
2	Not steamed – foliage	Peat-wood fibre mixture without foliage 100% reuse without steaming
3	Steamed 95°C - foliage	Peat-wood fibre mixture without foliage 100% reuse with steaming at 95°C
4	Not steamed + foliage	Peat-wood fibre mixture with foliage 100% reuse without steaming
5	Steamed 95°C + foliage	Peat-wood fibre mixture with foliage 100% reuse with steaming at 95°C
6	Steamed 85°C + foliage	Peat-wood fibre mixture with foliage 100% reuse with steaming at 85°C
7	Steamed 75°C + foliage	Peat-wood fibre mixture with foliage 100% reuse with steaming at 75°C
8	Steamed 95°C Rock wool	Rock wool granulates after shredding 100% reuse with steaming at 95°C

5 Results

5.1 Crop length

Steaming is restoring the growth potential of the substrate. All steamed objects give a similar crop stretching as the fresh control. Even at 75°C there is now inhibition of growth what so ever. The untreated control with foliage is clearly suffering from the reuse and the crop stays up to 10 cm shorter than the treated objects. The untreated object without foliage performs much better than the other untreated control, confirming earlier research of Harvestis that foliage in the substrate is more risky. The rock wool gave a less homogenous looking crop, this is due to the substrate structure, not due to the steam treatment. It was not possible to adapt the fertigation strategy on the rock wool separate from the rest of the trial.

Object Statistics	9 April $F(7,24)=2,195$ $p=0,071$	4 May $F(7,24)=14,766$ $p=2,617e-07$	2 June $X(7)=20,614$ $p=4,386e-04$
Fresh	20,8 ns	43,4 a	44,6 a
Not steamed - foliage	21,5 ns	44,5 a	43,5 a
Steamed 95°C - foliage	21,5 ns	44,5 a	45,0 a
Not steamed + foliage	20,4 ns	38,3 b	36,5 b
Steamed 95°C + foliage	21,9 ns	43,7 a	45,3 a
Steamed 85°C + foliage	21,5 ns	44,8 a	46,0 a
Steamed 75°C + foliage	22,0 ns	43,7 a	46,1 a

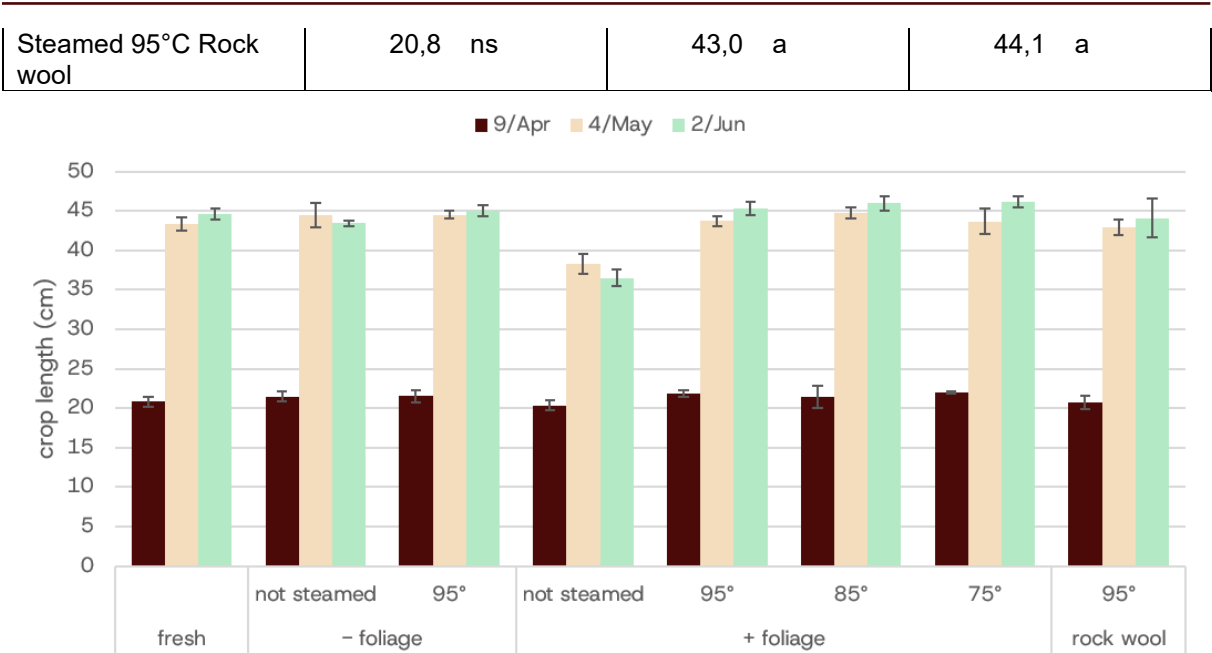
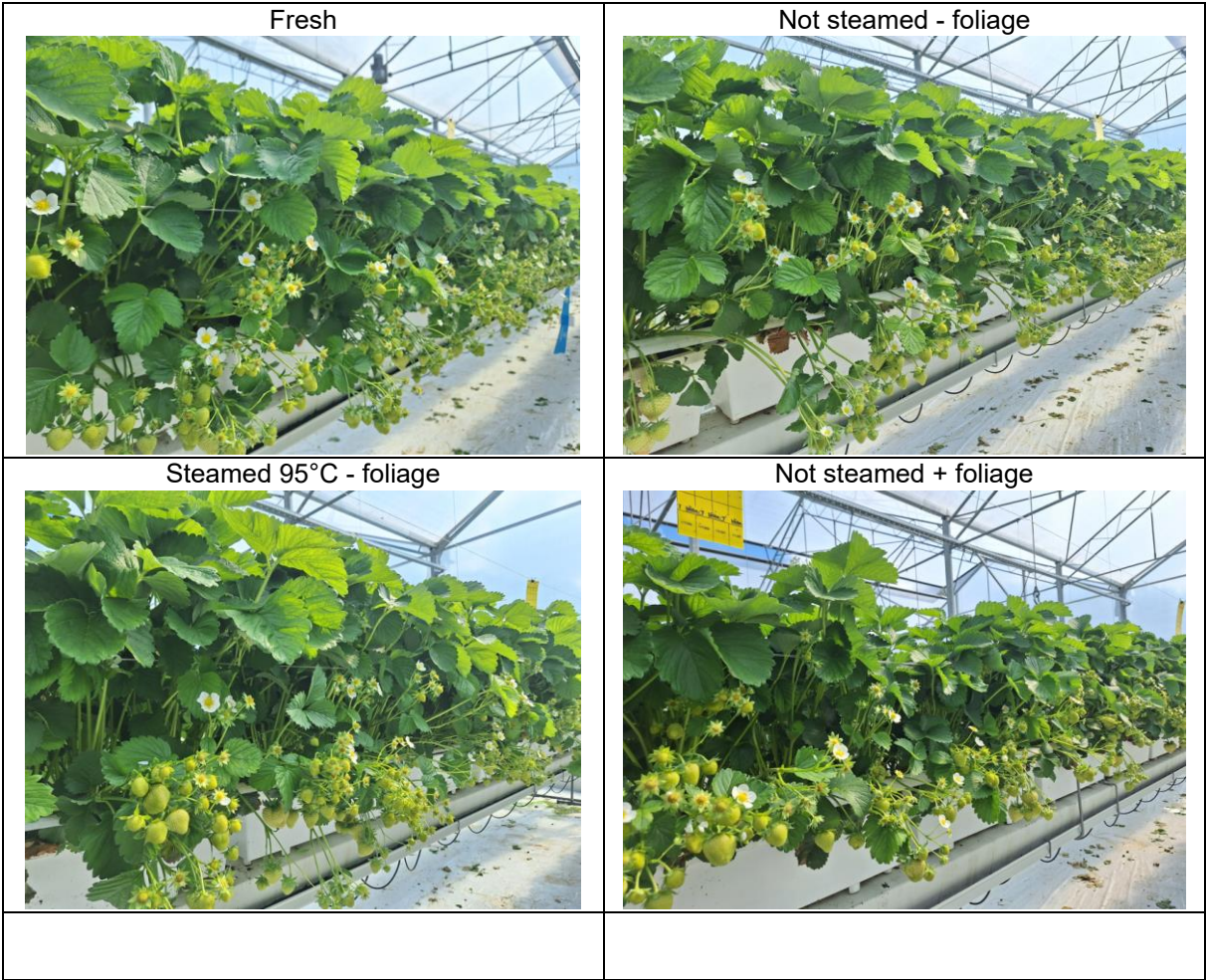
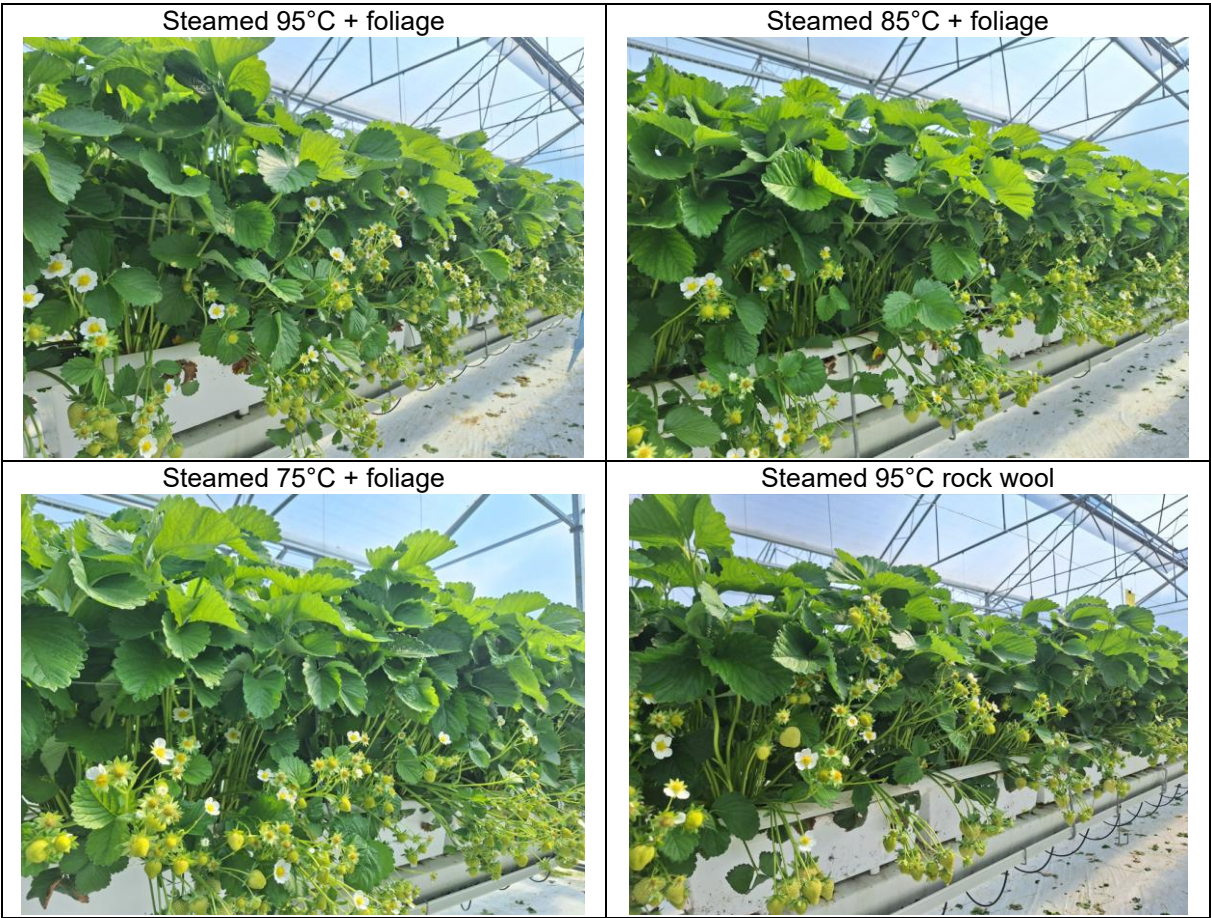


Figure 5-1 Crop length on 9 April, 4 May and 2 June

5.2 Crop assessment on 11 May 2026





5.3 Plant loss

There was no worth mentioning amount of plant loss due to root diseases in the cultivation. Plant loss was counted on 11 June 2025

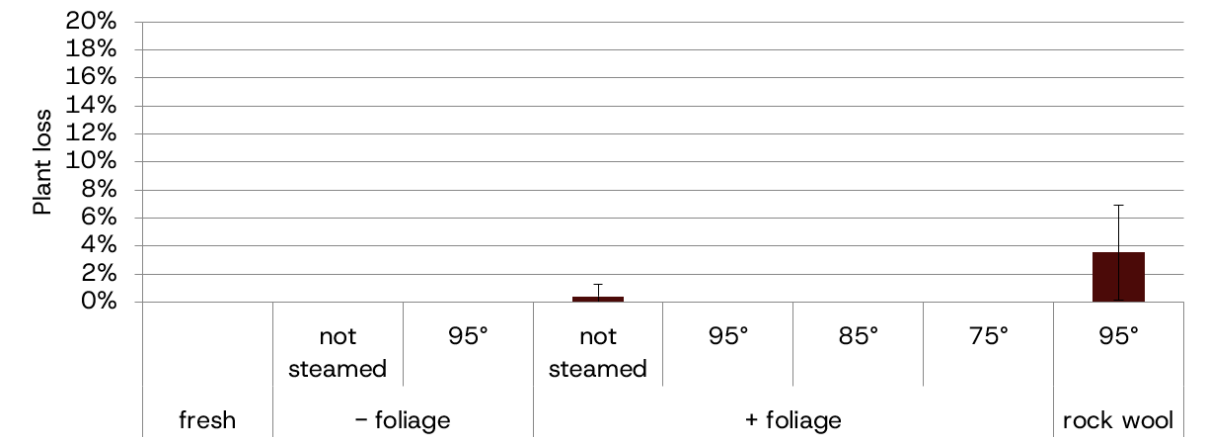


Figure 5-2 Plant loss in %

5.4 Yield and grading

Harvest started on 18 May, the last fruits were picked on 22 June. Results are in line with last year, steaming is restoring the potential of the substrate. On the fresh substrate we harvested 6,14 kg/m². Reuse without steaming gave a slight, not significant reduction to 5,94 kg/m² when the foliage was not reused together with the substrate. Reuse with foliage is clearly causing yield loss, in this case we only picked 5,05 kg/m². Steaming at 95°C without and with foliage in the shredded substrate is producing 6,35 and 6,31 kg/m². Also the steaming at lower temperatures is yielding to the same amount as the fresh substrate with 6,36 kg/m² at 85°C and 6,39 kg/m² at 75°C. The rock wool object had a slightly lower yield at 5,67 kg/m² and a big variation between the plots, indicating a less homogenous outgrowth.

Tabel 5-1 Yield and grading in kg/m²

Object	kg/plant	kg/m ²	Large 2A	Large A	Small	Misshapen	Waste
Statistics	X(7)=16,483 p=0,021	X(7)=16,483 p=0,021	F(7,24)=4,987 p=0,001	F(7,24)=4,147 p=0,004	F(7,24)=2,734 p=0,031	X(7)=2,028 p=0,958	X(7)=11,952 p=0,102
Fresh	0,61 a	6,14 a	3,14 a	1,41 ab	1,49 a	0,10 ns	0,00 ns
Not - foliage	0,59 a	5,94 a	2,85 ab	1,49 a	1,48 a	0,11 ns	0,00 ns
95 - foliage	0,63 a	6,35 a	3,41 a	1,49 a	1,37 ab	0,06 ns	0,01 ns
Not + foliage	0,51 b	5,05 b	2,16 b	1,26 b	1,52 a	0,10 ns	0,02 ns
95 + foliage	0,63 a	6,31 a	3,36 a	1,45 ab	1,38 ab	0,12 ns	0,00 ns
85 + foliage	0,64 a	6,36 a	3,33 a	1,50 a	1,41 ab	0,12 ns	0,01 ns
75 + foliage	0,64 a	6,39 a	3,29 a	1,54 a	1,42 ab	0,13 ns	0,02 ns
95 rock wool	0,57 ab	5,67 ab	2,93 ab	1,35 ab	1,20 b	0,18 ns	0,00 ns

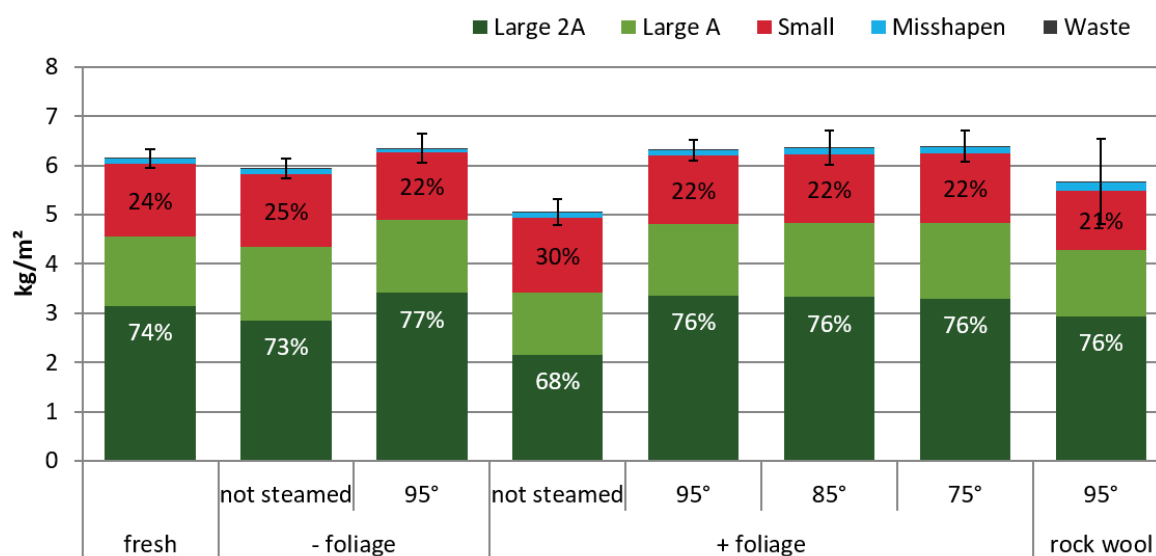
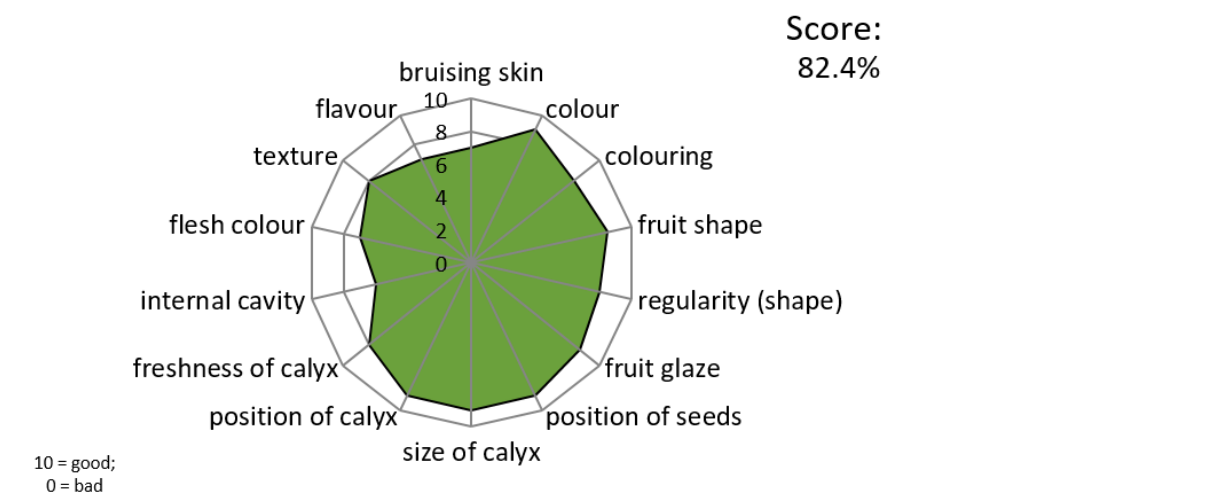


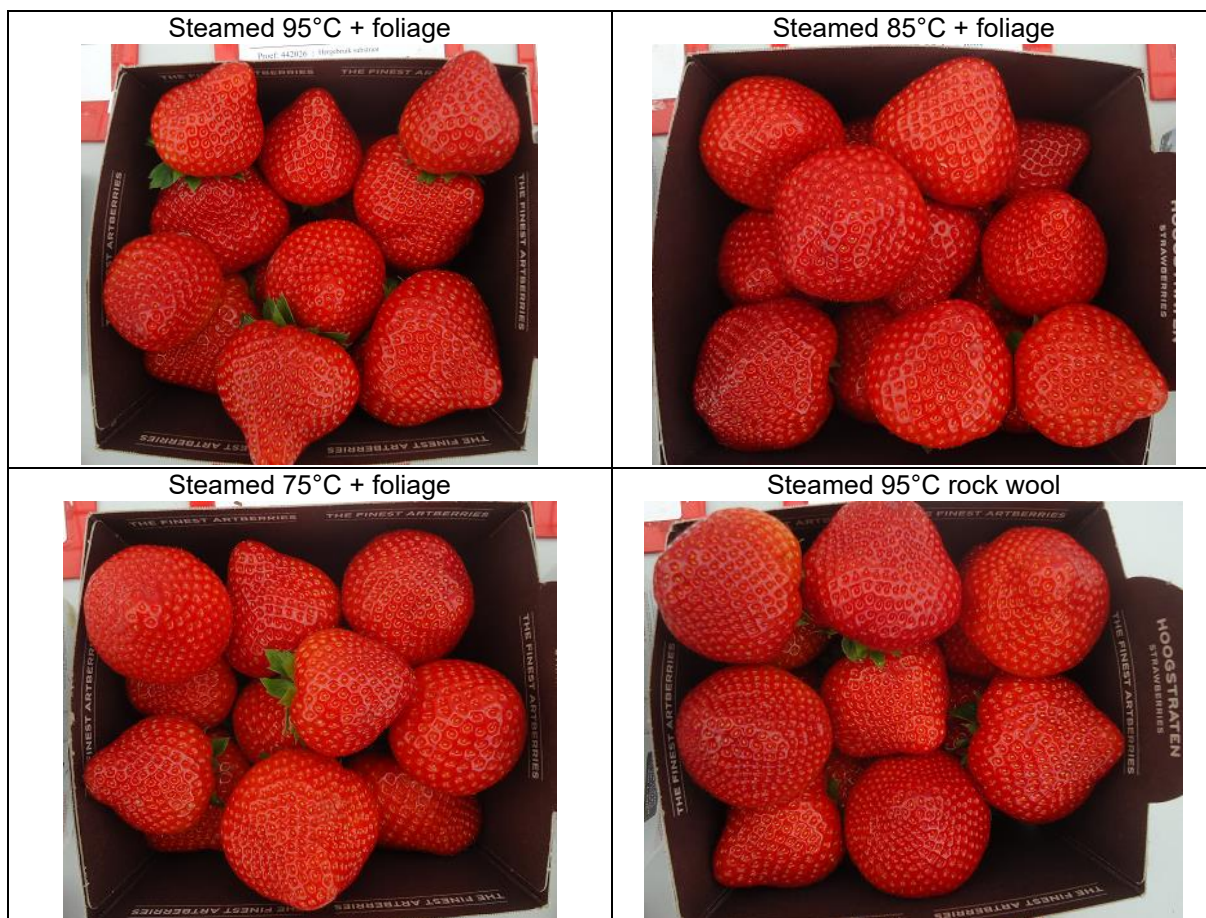
Figure 5-3 Yield and grading in kg/m²

5.5 Fruit quality

5.5.1 Fruit assessment

We did not see any differences in fruit quality in visual inspections on the harvest of 26 May and 8 June.





5.5.2 Firmness and brix

No noticeable differences are seen between the different objects of the trial.

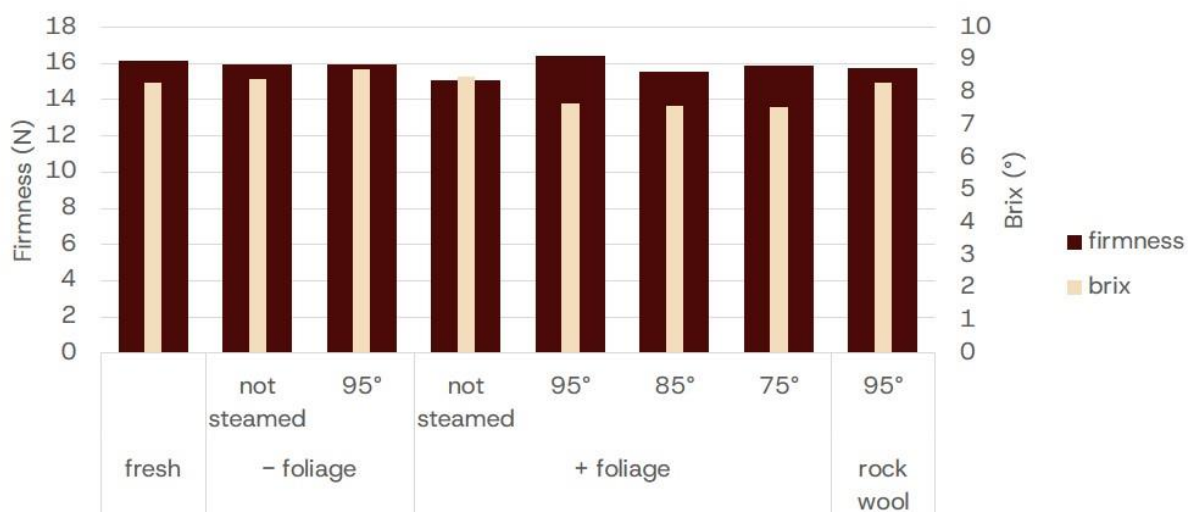


Figure 5-5 Firmness in Newton and Brix in degrees soluble content

5.5.3 Shelf life assessment

No differences were spotted in the 8 day shelf day tests on the harvest of 26 May and 8 June.

6 Conclusion

Steaming substrate is confirming the results of last year and more. When substrate is shredded after harvest for reuse, it leads to yield loss in the next cultivation. Especially when the foliage of the previous cultivation is shredded and reused together with the spent substrate. But steaming it seems to solve the problem. In this trial we succeeded to get optimal yielding and grading with 100% reuse of substrate with foliage after shredding and steaming of the substrate. And this trial shows that for a spring cultivation of *Sonsation* it suffices to steam at 75°C to get these results. Compared to the previous steaming at 95°C we save a lot of energy. Steaming at 95°C consumes power at 160 kWh, while steaming at 75°C only requires 90 kWh.

For growers of the region of Hoogstraten the technology of Soilsteam becomes very close to be an easy fit in their current way of growing strawberries. Growers already hire a company called Heecon bvba to clear their greenhouses from spent substrate. Together with the foliage the substrate is removed, shredded and transported away for composting purposes. With the Soilsteam installation it becomes possible to steam the shredded substrate and return it to the grower. With the same machine as they use to fill their plant containers with fresh substrate, they can fill the pots with reused substrate or a mixture of reused and fresh substrate. The trials show that there is no problem to be expected in yielding or fruit quality in cultivations with junebearers. Next challenge will be to try out steamed substrates in longer cultivations with everbearers or a double cropping in glasshouses with a junebearer.